BC-2800

Auto Hematology Analyzer

Operation Manual

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- all installation, expansion, change, modification and repair of this equipment are conducted by Mindray qualified personnel;
- applied electrical appliance is in compliance with relevant National Standards;

⚠ **Note** ⚠

This equipment is not intended for family usage.

This equipment must be operated by skilled/trained clinical personnel.

⚠ **Warning** ⚠

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and a brief description of the reason for return.

2. Freight policy. The customer is responsible for freight charges when equipment is shipped to Mindray for service (this includes customs charges).

Company Contact

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Free hot line: +86 800 830 3312

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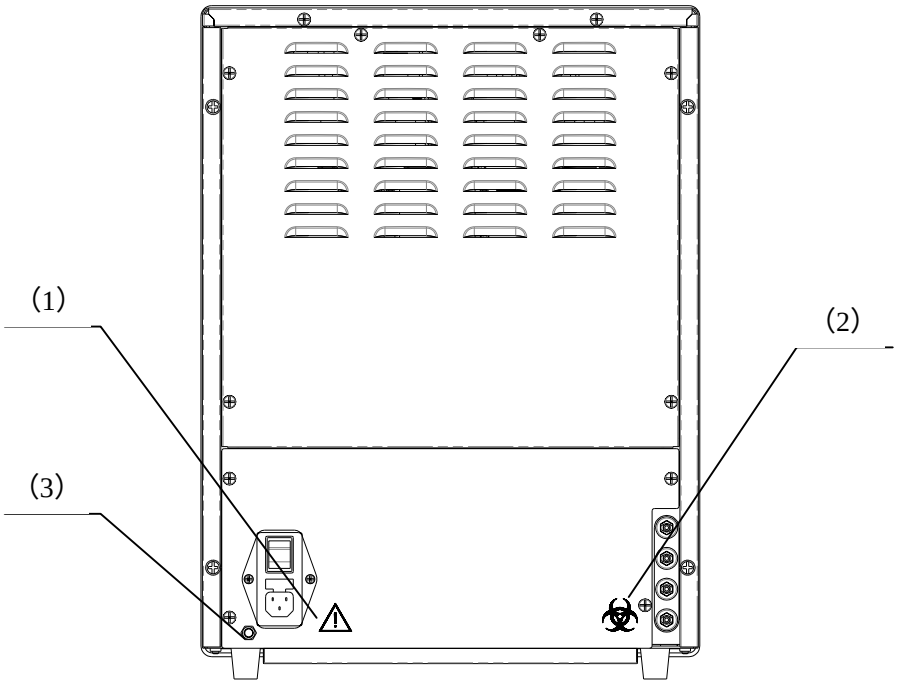
Safety Symbols

Symbol	Warning Condition	Action
	Biohazard: Consider all materials (specimens, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious.	Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.
	Probe Hazard: The probe is sharp and may contain biohazardous materials, including controls and calibrators.	Avoid any unnecessary contact with the probe and probe area.
	NOTE: Indicate to the operator information of importance in the procedure to be performed. This heading is also used to indicate specific sample handling techniques that are helpful in operating the instrument.	
	CAUTION: Indicate to the operator information of importance that could result in damage to the instrument or affect the test due to improper operation if these instructions are not followed.	
	WARNING: Indicate to the operator information regarding potential hazards that may cause personal harm to the operator if these instructions are not followed.	



(1)

WARNING

- To avoid electrical shock, be sure to disconnect the power supply before maintaining this device.

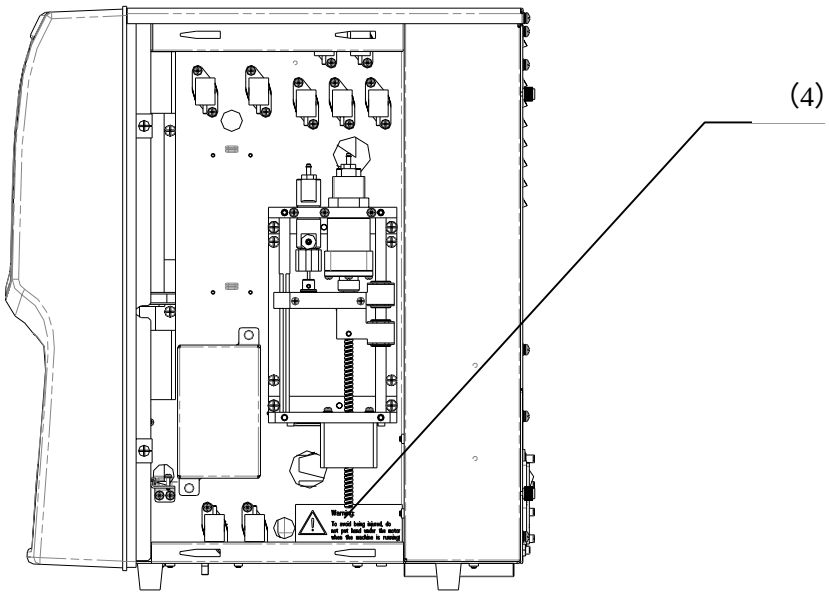
(2)

BIOHAZARD

- Consider waste that contain or have contacted human blood as being potentially infectious. Wear laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

(3)

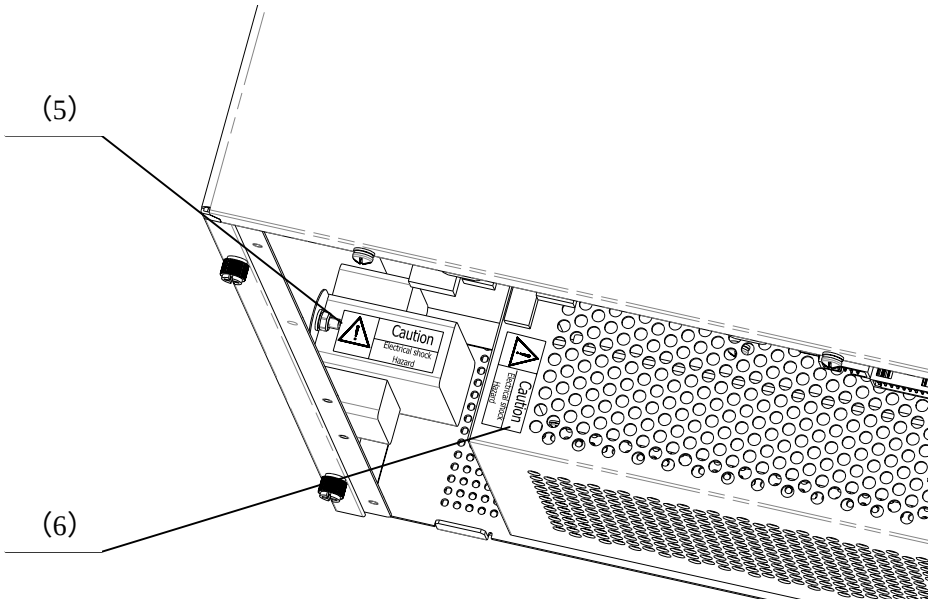
- Equipotentiality.



(4)

WARNING

- To avoid being injured, do not put hand under the motor when the machine is running.



(5) and (6) ⚠

WARNING

- To avoid electrical shock, be sure to disconnect the power supply before maintaining this device.

IVD FOR IN VITRO DIAGNOSTIC USE

LOT BATCH CODE

USE BY

CE MARK

DATE OF MANUFACTURE

MANUFATURER

AUTHORISED REPRESENTATIVE IN THE EUROPEAN COMMUNITY

SERIAL NUMBER

MANUFATURER

AUTHORISED REPRESENTATIVE IN THE EUROPEAN COMMUNITY

SERIAL NUMBER

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Chapter 1 Introduction

1.1 Foreword

This manual covers all the instructions related to the operation and general maintenance of the BC-2800 Auto Hematology Analyzer. To ensure this analyzer performs in the best way, please carefully read and comprehend the contents of this manual and operate/maintain this analyzer exactly as instructed.

This manual includes a detailed description of this analyzer, the specifications given by the manufacturer, methods to install, calibrate and maintain this analyzer, and measures to be taken when errors occur. It also presents the working principle of this analyzer and the recommended reagents.

Operation notes, limits and potential hazards are stressed where appropriate.

This chapter mainly deals with the following contents:

General
Introduces how this manual is organized and presents a brief introduction of all the chapters.

System introduction
Briefly introduces the main factors of this analyzer, including functions, accessories and optional parts.

Principles of operation
Introduces how the analyzer functions.

Specifications
Presents the specifications of this analyzer.

System operations
Describes the key functions, display areas and system menu and presents a brief introduction of how to operate this analyzer.

1.2 General

See Table 1-1 for the organization of this manual and brief introductions of the chapters.

Table 1-1 Organization of the BC-2800 operation manual

Chapters	Contents
Chapter 1 Introduction	Introduces organization of this manual, system introduction, principles of operation, specifications, system operations and operation summary.
Chapter 2 Installation	Introduces installation requirements and steps.
Chapter 3 Sample Analysis	Introduces how to analyze samples on this analyzer.
Chapter 4 Quality Control	Introduces how to run the QC program on this analyzer.
Chapter 5 Calibration	Introduces how to calibrate this analyzer.
Chapter 6 Sample Review	Introduces how to review, search and print the saved sample analysis results.
Chapter 7 Setup	Introduces how to set date, time and other system settings.
Chapter 8 Service	Introduces how to maintain this analyzer and replace the reagents.
Chapter 9 Troubleshooting	Introduces how to deals with the reported errors.
Appendix A Communication	Communication protocol.

1.3 System Introduction

1.3.1 Name and Intended Use

The full name of this analyzer is BC-2800 Auto Hematology Analyzer. It is a quantitative, automated hematology analyzer and leukocyte differential counter for In Vitro Diagnostic Use in clinical laboratories.

Note

The purpose of this analyzer is to identify the normal patient, with all normal system-generated parameters, and to flag or identify patient results that require additional studies.

It determines the following 19 hematological parameters and presents 3 histograms of blood specimens.

Table 1-2 Parameters and histograms

Group	Parameter	Abbreviation
WBC Group	White Blood Cell or leukocyte	WBC
	Lymphocyte	Lymph#
	Mid-sized cell	Mid#
	Granulocyte	Gran#
	Lymphocyte percentage	Lymph%
	Mid-sized cell percentage	Mid%
	Granulocyte percentage	Gran%
	WBC histogram	
HGB Group	Hemoglobin Concentration	HGB
RBC Group	Hemoglobin Concentration	RBC
	Hematocrit	HCT
	Mean Corpuscular (erythrocyte) Volume	MCV
	Mean Cell (erythrocyte) Hemoglobin	MCH
	Mean Cell (erythrocyte) Hemoglobin Concentration	MCHC
	Red Blood Cell (erythrocyte) Distribution Width Coefficient of Variation	RDW-CV

	Red Blood Cell (erythrocyte) Distribution Width Standard Deviation	RDW-SD
	RBC histogram	
PLT Group	Platele	PLT
	Mean Platelet Volume	MPV
	Platelet Distribution Width	PDW
	Plateletcrit	PCT
	PLT histogram	

1.3.2 Classifications

CE: General In vitro diagnostic medical devices

1.3.3 Supplementary Data

Mindray aperiodically issues and delivers supplementary documents pertaining to operation or maintenance of this instrument. Be sure to read and observe these documents carefully and precisely as well as insert them into this manual for convenient reference。

1.3.4 Service Assistance

If this analyzer does not operate properly, follow the directions in **Chapter 9, Troubleshooting**. If the error cannot be corrected by the recommended methods, contact the Mindray Customer Service Department or the distributor

1.3.5 Reagents, Calibrators and Controls

The reagents, controls, calibrators, and analyzer are components of a whole system and must be used as one. Be sure that any products to be used have been tested and certified by the manufacturer.

Mindray recommends the reagents described in **Chapter 1.5.10 Reagents**. Do not use the reagents or controls from different suppliers, or else the analyzer may not perform as promised and even be damaged.

Each reagent should be examined prior to its application. Product integrity may be compromised in damaged containers. If a package appears damaged, inspect the inside for signs of leakage or moisture and find them, do not use the reagent. Read the user's instructions of the reagents and operate as instructed when using the reagents. Unless otherwise specified, reagents must be stored and used at room temperature.

Note

To properly and safely use the reagents, be sure to read the tags on the package and the supplied data sheet.

1.3.5.1 Reagents

1. Diluent

Besides diluting the blood sample, the diluent provides an environment similar to blood plasma to keep the sizes of blood cells unchanged within a certain period of time and serves as a conductive media for blood cells analysis.

2. Lyse

The lyse can rapidly break down the red blood cell membranes and reduce cellular debris to a size small enough so that it does not interfere with white blood cell analysis. White cells can then be segregated into three sub-populations for differential analysis.The absorbency of the lyse-hemoglobin mixture is determined by the hemoglobin.

3. Rinse

The rinse is a detergent used to wash the tubing and wet the volumetric tube.

4. E-Z Cleanser

The Enzymatic Cleanser is an enzyme based, isotonic cleaning solution and wetting agent used to rinse the tubing and bath. This cleanser will not damage the plastic parts of the analyzer.

5. Probe Cleanser

The probe cleanser is used to maintain the analyzer.

1.3.5.2 Calibrators and Controls

Calibrators and controls are whole blood products manufactured to calibrate and verify the operation of instruments.

The “calibrators” and “controls” that appear in the rest of this manual refer to the calibrators and controls to be used on this analyze only. You shall order them only from Mindray customer service department or the distributor.

1.4 Principles of Operation

1.4.1 Measuring Principle

This analyzer adopts the Coulter Principle to count WBC, RBC and PLT cells and to draw their corresponding histograms. The Hemoglobin concentration (HGB) is obtained by the colorimetric method. The result of the rest parameters are derived from those (see **Chapter 1.4.4, Derivation of Parameters**).

1.4.2 Dilution

Usually in blood specimens, the cells are too close to each other to be identified or measured. For this reason, the diluent is used to separate the cells so that they are drawn through the aperture one at a time as well as to create a conductive environment for blood analysis. This analyzer can processes two types of blood samples – whole blood samples (see **Chapter 2.5.1 Preparing Whole Blood Samples**) and prediluted blood samples (see **Chapter 2.5.2 Preparing Prediluted Samples**). When analyzing a whole blood sample, this analyzer aspirates 13 μL of the sample and follow the procedure presented in Figure 1-1 to dilute it before proceeding to the actual analysis.

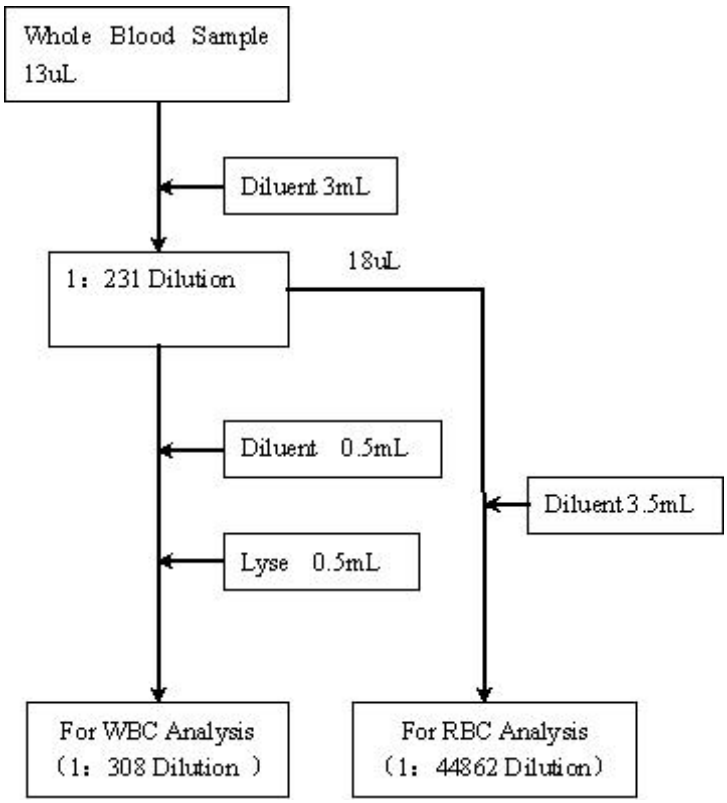


Figure 1-1 How a whole blood sample is diluted

When analyzing a prediluted sample, the operator should first collect 20 μ L capillary specimen and dispense 1.6mL diluent from this analyzer to predilute the specimen. Then the operator should present the prediluted sample to the analyzer, which will aspirate 0.7ml of the sample for further dilution, as Figure 1-2 shows.

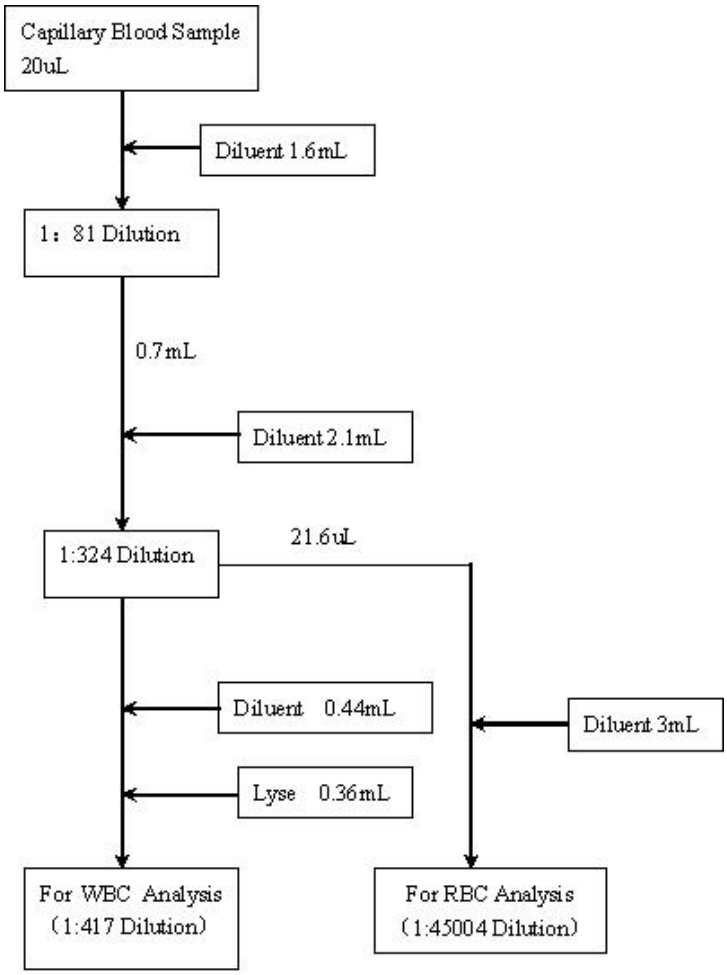


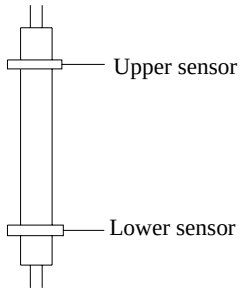
Figure 1-2 How a prediluted sample is diluted

After reacting with the diluent and lyse, the cells mainly fall into the following three volume ranges:

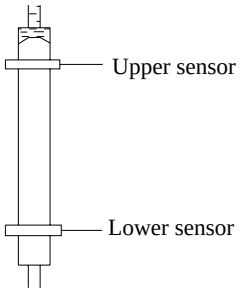
WBC:	30～350	fL
RBC:	25～250	fL
PLT:	2～30	fL

1.4.3 Control of Sample Volume

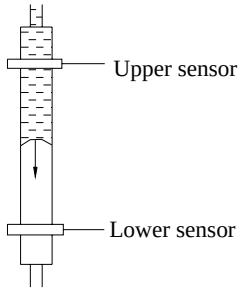
This analyzer employs an optical volumetric metering system to determine the sample volume aspirated through the aperture. Each count cycle, as shown in Figure 1-3, starts when the liquid surface passes the upper sensor of the volumetric tube and ends till the lower sensor is reached. If bubbles or an abnormal flow rate is detected, the system will alarm the operator for errors. When this happens, see Chapter 9 **Troubleshooting** for the solutions.



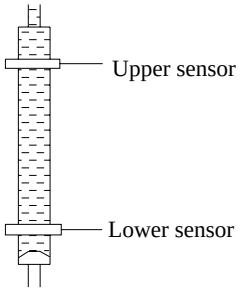
1 Empty when start



2 Liquid surface fall down through the volumeritc tube



3 Counting start when the liquid surface pass the upper sensor.



4 Counting end when the liquid surface pass the lower sensor

Figure 1-3 How sample volume is controlled

1.4.4 Derivation of Parameters

1.4.4.1 **WBC**

WBC(10^9/ L) is the number of leukocytes measured directly by counting the white blood cells passing through the aperture. Note that when you observe in the microscope NRBCs (nucleated red blood cells), which do not react with the lyse and can be mistaken by the analyzer for white cells, be sure to correct the system-generated result by the following formula,

$$WBC' = WBC \times \frac{100}{100 + NRBC}$$

where WBC represents the system-generated white cell number, NRBC the number of NRBCs counted in 100 white cells and WBC′ the corrected white cell number.

1.4.4.2 WBC differential

With the help of the diluent and lyse, this analyze can size the white cells into three sub-populations - lymphocytes, mid-sized cells, and granulocytes.

Lymphocytes are the largest white cells whose sizes are 30fL～85fL. Granulocytes are the smallest white cells whose sizes are above 125fL. Between them are the mid-sized cells whose sizes are 85fL～125fL.

Based on the WBC histogram, this analyzer calculates Lymph%, Mid% and Gran% as follows,

$$(Lymph\%)(\%) = \frac{PL}{PL + PM + PG} \times 100$$

$$(Mid\%)(\%) = \frac{PM}{PL + PM + PG} \times 100$$

$$(Gran\%)(\%) = \frac{PG}{PL + PM + PG} \times 100$$

where PL = particles in the lymphocyte region ($10^9 / L$)

PM = particles in the mid size region ($10^9 / L$)

PG = particles in the granulocyte region ($10^9 / L$).

Having achieved the three parameters above, this analyzer proceeds to calculate the Lymph# , Mid# and Gran# as follows.

$$Lymph\#(10^9 / L) = \frac{Lymph\%(\%) \times WBC(10^9 / L)}{100}$$

$$Mid\#(10^9 / L) = \frac{Mid\%(\%) \times WBC(10^9 / L)}{100}$$

$$Gran\#(10^9 / L) = \frac{Gran\%(\%) \times WBC(10^9 / L)}{100}$$

1.4.4.3 **HGB**

Using the colorimetric method, this analyzer calculates hemoglobin concentration (g/L) as follows.

HGB(g/L)=Constant×Log_{10}(Blank Photocurrent/Sample Photocurrent)

1.4.4.4 **RBC**

RBC (10^{12}/L)is the number of erythrocytes measured directly by counting the erythrocytes passing through the aperture.

1.4.4.5 **MCV**

Based on the RBC histogram, this analyzer calculates the mean cell volume (MCV) and expresses the result in fL .

1.4.4.6 HCT, MCH and MCHC

This analyzer calculates the HCT (%), MCH(pg) and MCHC(g/L) as follows:

$$HCT(\%) = \frac{RBC(10^{12}/L) \times MCV(fL)}{10}$$

$$MCH(pg) = \frac{HGB(g/L)}{RBC(10^{12}/L)}$$

$$\mathrm{MCHC(g/L)} = \frac{\mathrm{HGB(g/L)}}{\mathrm{HCT(\%)}} \times 100$$

1.4.4.7 RDW-CV

Based the WBC histogram, this analyzer calculates the CV (Coefficient of Variation) of the erythrocyte distribution width.

1.4.4.8 RDW-SD

RDW-SD (RBC Distribution Width – Standard Deviation, fL) is set on the 20% frequency level with the peak taken as 100%, as Figure 1-4 shows.

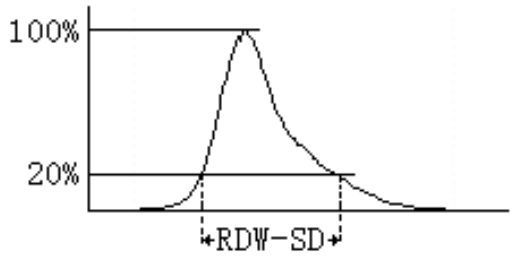


Figure 1-4 RBC Distribution Width – Standard Deviation

1.4.4.9 PLT

PLT (10^9/L) is measured directly by counting the platelets passing through the aperture.

1.4.4.10 MPV

Based on the PLT histogram, this analyzer calculates the mean platelet volume (MPV, fL).

1.4.4.11 PDW

Based on the PLT histogram, this analyzer calculates the platelet distribution width (PDW).

1.4.4.12 PCT

This analyzer calculates the PCT as follows.

$$PCT(\%) = \frac{PLT(10^9/L) \times MPV(fL)}{10000}$$

1.5 Specifications

1.5.1 Parameter Description

Table 1-3 Directly measured parameters and histograms

Parameter	Abbreviation	Default Unit
White Blood Cell or leukocyte	WBC	10^9/L
Hemoglobin Concentration	HGB	g/L
Red Blood Cell or erythrocyte	RBC	10^{12}/L
Platelet	PLT	10^9/L
WBC histogram		
RBC histogram		
PLT histogram		

Table 1-4 Parameters derived from histograms

Parameter	Abbreviation	Default Unit
Lymphocyte percentage	Lymph%	%
Mid-sized cell percentage	Mid%	%
Granulocyte percentage	Gran%	%
Mean Corpuscular (erythrocyte) Volume	MCV	fL
Red Blood Cell (erythrocyte) Distribution Width Coefficient of Variation	RDW-CV	%
Red Blood Cell (erythrocyte) Distribution Width Standard Deviation	RDW-SD	fL
Mean Platelet Volume	MPV	fL
Platelet Distribution Width	PDW	

Table 1-5 Calculated parameters

Parameter	Abbreviation	Default Unit
Lymphocyte	Lymph#	10^9/L
Mid-sized cell	Mid#	10^9/L
Granulocyte	Gran#	10^9/L
Hematocrit	HCT	%

Mean Cell (erythrocyte) Hemoglobin	MCH	pg
Mean Cell (erythrocyte) Hemoglobin Concentration	MCHC	g/L
Mean Platelet Volume	PCT	%

1.5.2 Sampling Features

1. Sample volumes required for each analysis：

Whole Blood Mode (vein blood) 13uL

Prediluted Mode (capillary blood) 20μL

2. Actually used sample volumes：

For a WBC analysis 300μL (including diluent and lyse)

For a RBC/PLT analysis 300μL (including second dilution)

3. Lyse used for every analysis 0.5mL(whole blood)，0.36mL(capillary blood)

4. Dilution rate

	Whole blood sample	Prediluted sample
WBC/HGB	1:308	1:417
RBC/PLT	1:44862	1:45004

5. Aperture size 80μm in diameter)，70μm in length.

6. Throughput More than 30 samples/hour.

1.5.3 Performance

1. Display range

Parameter	Operating range
WBC(10^9/L)	0.0-499.9
RBC(10^{12}/L)	0.0-9.99
HGB(g/L)	0-300
MCV(fL)	0.0-250.0
PLT(10^9/L)	0-2999

2. Linear range

Parameter	Linear range
WBC(10^9/L)	0.0-99.9
RBC(10^{12}/L)	0.0-9.99
HGB(g/L)	0-300
PLT(10^9/L)	0-999

3. Reproducibility

Parameter	Condition	Reproducibility(CV%)
WBC ($\times 10^9$/L)	4.0 - 7.5	≤ 3.0
	7.6 - 15.0	≤ 2.0
RBC ($\times 10^{12}$/L)	3.00 - 4.50	≤ 2.0
	4.51 - 6.50	≤ 1.5
HGB (g/L)	110 – 180	≤ 1.5
MCV (fL)	70.0 – 100.0	≤ 1.0
PLT ($\times 10^9$/L)	100 – 200	≤ 5.0
	201 – 500	≤ 4.0

1.5.4 Display

Color LCD, 640×480.

1.5.5 Input/Output

Two RS232 serial ports (one for computer and the other for scanner).
One parallel interface (for printer or floppy disk drive).
One PS/2 keyboard interface (the keyboard is optional).
A power interface for the floppy disk drive (only works with Mindray's special power cable).

1.5.6 Scanner(optional)

TYSSO CCD-82 or its compatible.

1.5.7 Built-in Thermal Recorder

1.5.8 Printer (optional)

EPSON LQ-300K, LQ-300K+, or EPSON LQ-1600K, or their compatible.

1.5.9 Alarms

See **Chapter 9 Troubleshooting** for the error codes.

1.5.10 Reagents

Diluent	M-30D	DILUENT
Rinse	M-30R	RINSE
Lyse	M-30L	LYSE
E-Z cleanser(Enzyme cleanser)	M-30E	CLEANSER
Probe cleanser	M-30P	CLEANSER

1.5.11 **Power**

Voltage：

AC 220V±15% 50/60Hz±1Hz

or AC 110V±15% 50/60Hz±1Hz

Consumption：

180 VA

Fuse：

250 V T2A

or 125V T4A

1.5.12 **Ambient Temperature and Humidity**

Ambient Temperature:15℃～30℃(When overheated, the system will give an alarm without stopping running)

Relative humidity: 30%～85%

Atmospheric pressure: 60.0kPa～106.0kPa.

1.5.13 Transportation and storage environment

Ambient temperature: -10℃～40℃；

Relative humidity: 10%～93%；

Atmospheric pressure: 50.0kPa～106.0kPa.

1.5.14 **Dimension**

Width	Height	Thickness
32.2cm	43.7cm	39.7cm

1.5.15 **Weight**

Net Weight： 17.9KG

Gross Weight： 25.2 KG

1.6 System Operation

1.6.1 Main Unit

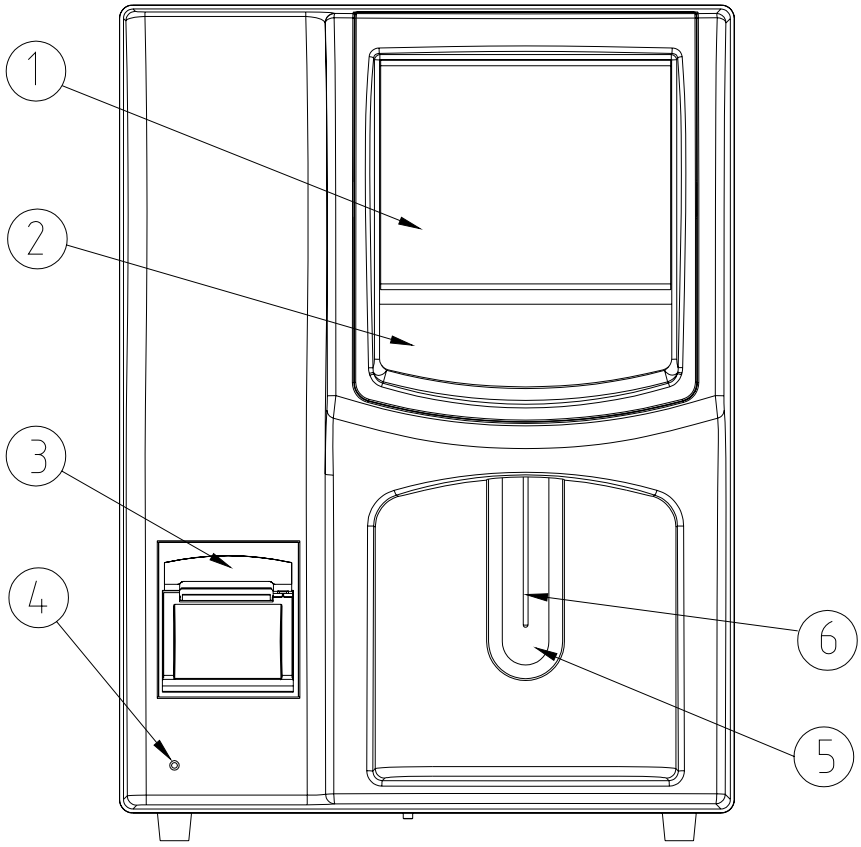


Figure 1-5 Front view

1 ---- LCD

2 ---- Keypad

3 ---- Recorder

4 ---- Power Indicator

5 ---- [START] key

6 ---- Sample Probe

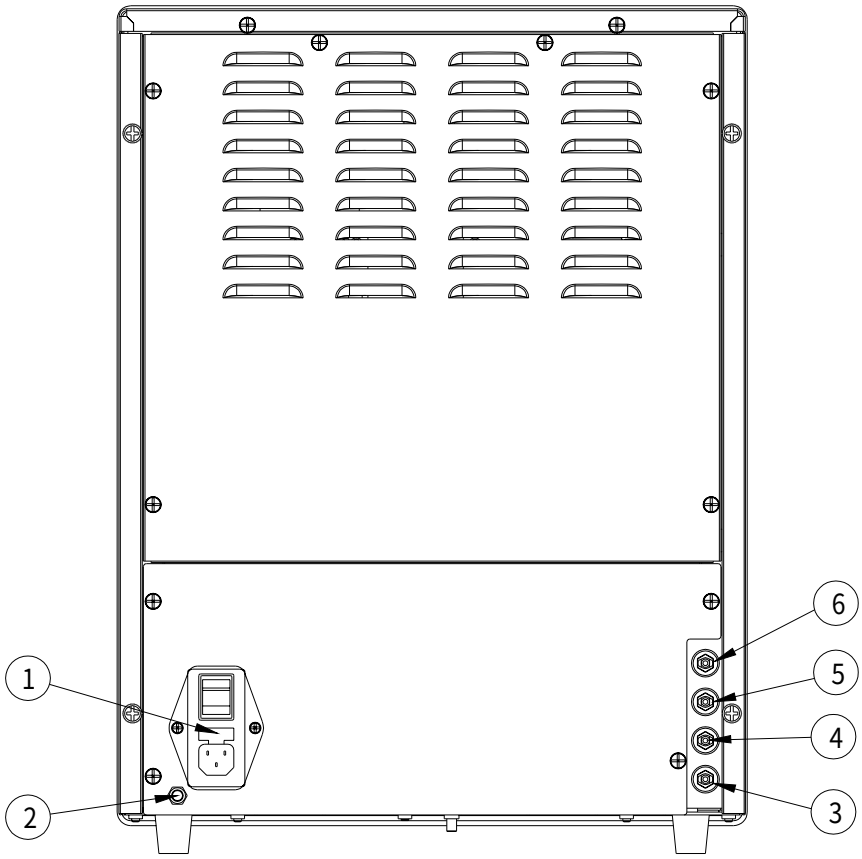


Figure 1-6 Back view

1 --- Power switch

2 --- Equipotentiality

3 --- Waste Outlet (Red)

4 --- Lyse Inlet (Orange)

5 --- Rinse Inlet (Blue)

6 --- Diluent Inlet (Green)

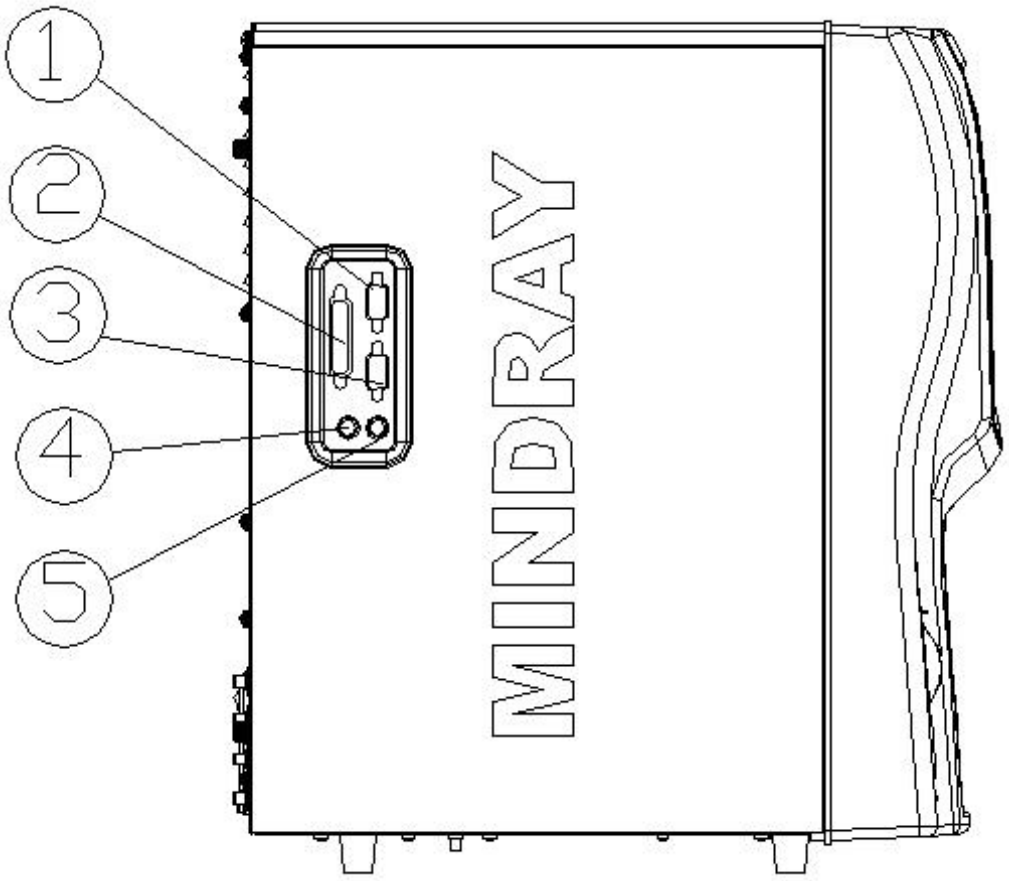


Figure 1-7 Left view

1 --- RS232 Port1 (for the scanner)

2 --- Parallel (also for the floppy disk drive)

3 --- RS232 Port 2(for the computer)

4 --- Power Interface of Floppy Disk Drive

5 --- Keyboard Interface

1.6.2 **Display Areas**

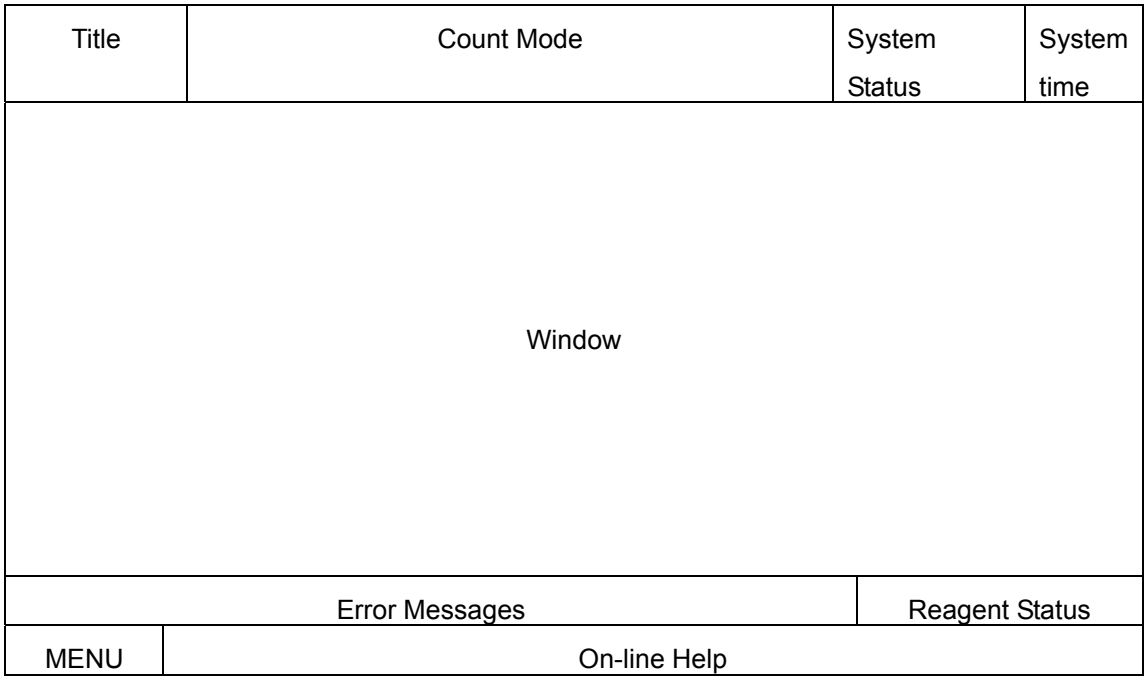


Figure 1-8 Display areas

Title area： Displays the screen title, such as ***Count*** or ***Review***.

Count Mode area：Displays current count mode. Six count modes are available.

Whole Blood - All Parameter
Prediluted - All Parameter
Whole Blood - WBC/HGB
Prediluted - WBC/HGB
Whole Blood - RBC/PLT
Prediluted - RBC/PLT

System Status area：Displays whether the system is ready for sample analysis. Three modes are available, ***Ready***, ***Running*** and ***Waiting***.

System Time area：Displays system.

Window area： Displays all types of operation information.

Error Messages Area：Displays error messages.

Reagent Status：Displays status of the remaining reagents. See chapters 3 and 7 for details.

On-Line Help：Displays help information.)

1.6.3 Input Devices

The input devices includes a [START] key, 18-key keypad and PS/2 keyboard(optional).

Note

If your analyzer is not equipped with a PS/2 keyboard, you will not be able to use the functions controlled by the keyboard only.

The [START] key is located behind the sample probe.

The keypad consists of 18 keys, as Figure 1-9 shows.

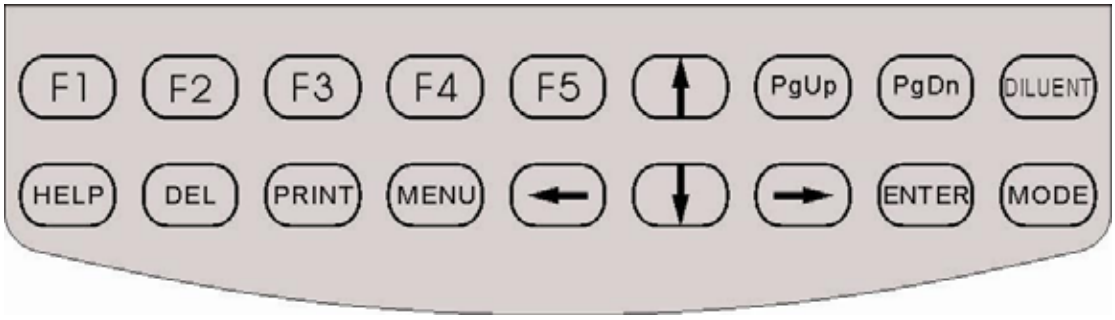


Figure 1-9 Keypad

A PS/2 keyboard can be connected to the PS/2 interface of this analyzer and it is useful when you have to edit complicated information.

See Table 1-6 for the major functions of the keys.

Table 1-6 Key functions

Keypad	Keyboard	[START] key	Functions
[MENU]	[Esc]		Enters/exits the system menu.
[PRINT]	[P] or [p]		Prints by the recorder or printer.
[HELP]	[H] or [h]		Displays help information.
[DEL]	[Del] or [Delete]		Deletes data or task.
[DILUENT]			Enters the **Add diluent** screen.
[MODE]	[Ctrl + A]		Switches to another analysis mode (works only in the **Count** screen).
[ENTER]	[Enter]		Confirms a certain operation.
[PgUp] and [PgDn]	[PgUp] or [PgDn]		Switches to another screen; enters digits.
[↑] [↓]	[↑] [↓]		Moves the cursor to a certain

[→][←]	[→][←]		position.
[F1] [F2] [F3] [F4] [F5]	[F1] [F2] [F3] [F4] [F5]		Function keys.
	Other keys		Other functions.
		[START]	Starts aspiration.

1.6.4 Screen Saver

To extend the service life of the LCD, this analyzer will enter the screen saver if no any operation was done in the past 10 minutes. When it happens, the LCD will be dark and the power indicator will be flickering. You can press any key to resume the display.

1.6.5 System Menu

See Figure 1-10 for the structure of the system menu.

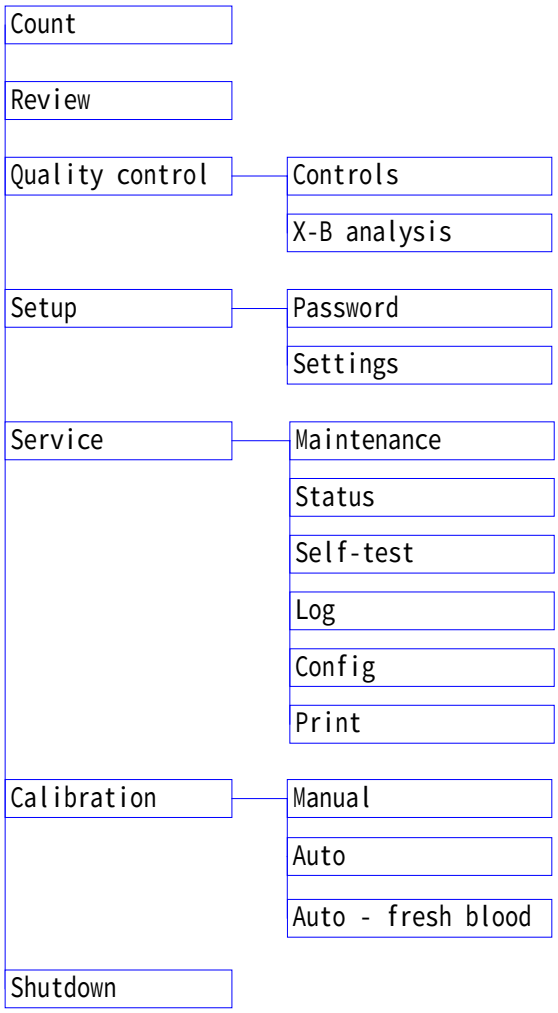


Figure 1-10 System menu

1.7 Operation Summary

The BC-2800 can analyze two types of blood specimens – whole blood samples and prediluted blood samples. See Table 1-7.

Table 1-7 Operation summary

Do preliminary checks (reagent and waste containers, tubing connections, power connections and the like)
Turn on the analyzer power
The system begins self-test and does the startup procedure and then enters the ***Count*** screen(if every thing is normal).
Select appropriate count mode and prepare the samples to be analyzed.
Present the sample to the sample probe and press the [START] key for aspiration. The system will automatically analyzes the sample and displays the results.
Edit patient information(optional)
Print out analysis result
Do the shutdown procedure.
Turn off the power.

Chapter 2 Installation

2.1 **Unpacking**

When you receive this analyzer, carefully unpack and check it. File a claim immediately with the shipping carrier if you find any physical damage.

Compare the delivered goods against the packing list to ensure that the shipment is complete. If the shipment appears incomplete, notify Mindray Customer Service Department or your distributor immediately.

2.2 Installation Requirements

2.2.1 Installation Environment

The environment should be as free as possible from dust, mechanical vibrations, loud noises and electrical interference. Avoid proximity to brush-type motors, flickering fluorescent lights and electrical contacts that regularly turn on and off. Avoid placing this analyzer in direct sun or in front of a source of heat or draft.

Operating this analyzer in ways other than those specified by this manual may damage it and leads to wrong analysis result.

2.2.2 Space Requirement

Be sure to place this analyzer on a table with enough space for the reagent containers.

Note

Be sure to keep the reagent at the same height as the analyzer.

2.2.3 Power Requirements

This analyzer requires a properly grounded socket supplying AC 220V±15%(or 110V±15%). The power frequency should be 50/60±1Hz, the maximum power consumption 180VA, fuse 250V 2A or 125V 4A. If possible, connect this analyzer to a dedicated ground line.

Note that it is imperative that this analyzer be grounded. Be sure to connect the Equipotentiality at the back of the analyzer to a dedicated ground line.

Note

Make sure the input power meets the requirements and an appropriate fuse is installed on it.

2.3 Installation

2.3.1 Tubing Connection

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

2.3.1.1 Connecting the diluent container

Take out the diluent inlet tubing with a green connector from the accessory kit.

Take out the diluent container, in which there should be enough diluent.

Insert the tubing end that has no connector into the diluent container, as Figure 2-1 shows and turn the container cover clockwise until secure.

Connect the tubing connector to the **DILUENT** inlet (green) on the back of BC-2800 and turn it clockwise until secure.

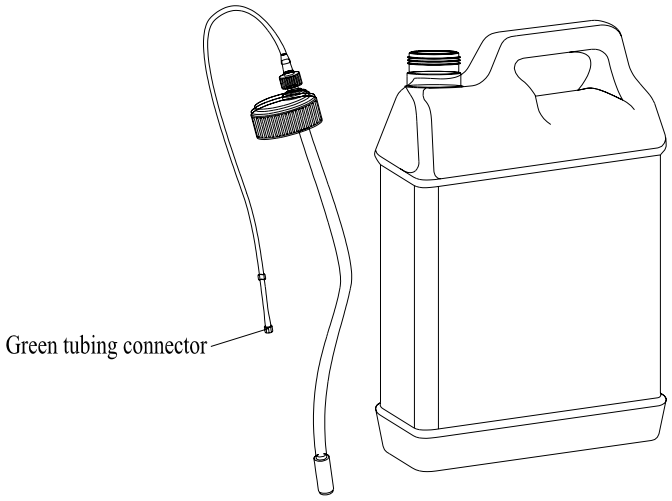


Figure 2-1 Diluent container

Do the following steps when the installation is done.

1. Enter the diluent volume as instructed by section 7.2.1.1 **Setting remaining volumes for reagents**.

2. Enter the expiration date as instructed by section 7.2.1.3 **Setting expiration dates of reagents**.

3. Prime the diluent tubing with diluent as instructed by section 8.1.1 **Diluent Prime**.

2.3.1.2 Connecting the rinse container

Take out the rinse inlet tubing with a blue connector from the accessory kit.
Take out the rinse container, in which there should be enough rinse.
Insert the tubing end that has no connector into the rinse container, as Figure 2-2 shows and turn the container cover clockwise until secure.
Connect the tubing connector to the **RINSE** inlet (blue) on the back of BC-2800 and turn it clockwise until secure.

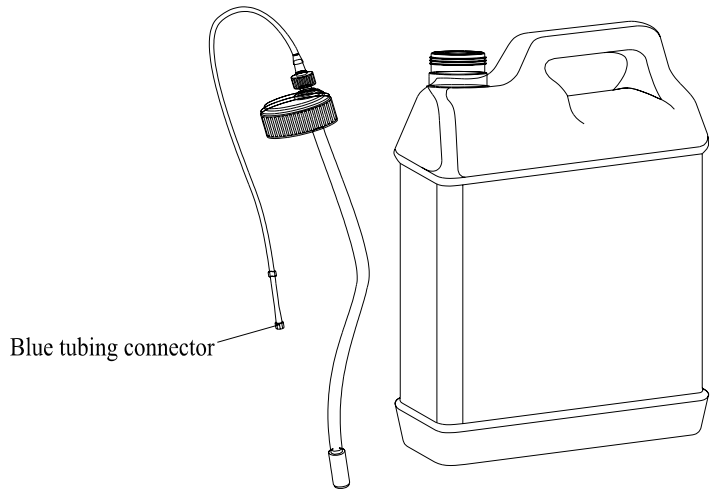


Figure 2-2 Rinse connector

Do the following steps when the installation is done.

1. Enter the rinse volume as instructed by section 7.2.1.1 **Setting remaining volumes for reagents**.

2. Enter the expiration date as instructed by section 7.2.1.3 **Setting expiration dates of reagents**.

3. Prime the rinse tubing with rinse as instructed by section 8.1.2 **Rinse Prime**.

2.3.1.3 Connecting the lyse

Take out the lyse inlet tubing with an orange connector from the accessory kit
Take out the lyse container, in which there should be enough lyse.
Insert the tubing end that has no connector into the lyse container, as Figure 2-3 shows, and turn the container cover clockwise until secure.
Connect the tubing connector to the **LYSE** inlet (orange) on the back of BC-2800 and turn it clockwise until secure.

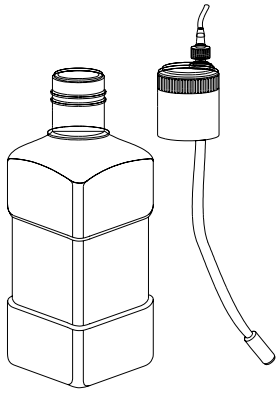


Figure 2-3 Lyse container

Do the following steps when the installation is done.

Enter the lyse volume as instructed by section 7.2.1.1 **Setting remaining volumes for reagents**.

Enter the expiration date as instructed by section 7.2.1.3 **Setting expiration dates of reagents.**

Prime the lyse tubing with as instructed by section 8.1.3 **Lyse Prime**.

2.3.1.4 Connecting the waste container

Take out the waste inlet tubing with a red connector from the accessory kit.

Connect the tubing connector to the **WASTE** inlet (red) on the back of the analyzer and turn it clockwise until secure.

Place the waste container on a table as high as or lower than the analyzer.

Insert the other end of the tubing into the waste container.

Enter the volume of the waste container as instructed by section 7.2.1.2 **Setting volume of dischargeable waste**.

2.3.2 **Waste Disposal**

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

WARNING

Handle and dispose of the waste according to acceptable laboratory, local state and national standards.

2.4 Loading Recording Paper

Follow the steps given below to install the recording paper.

1. Follow the arrow in the figure below to open the door of the recorder, as Figure 2-4 shows.

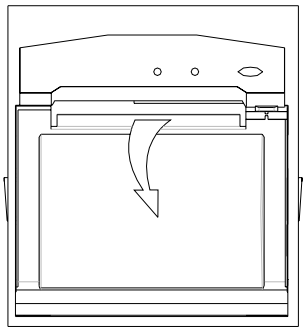


Figure 2-4 Open the recorder door

2. Lift the press bar, as Figure 2-5 shows.

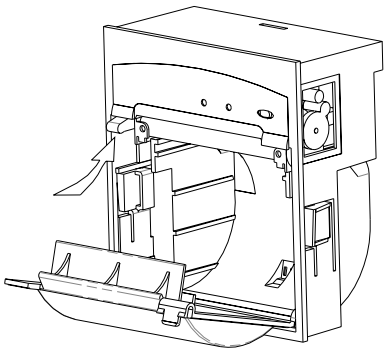


Figure 2-5 Lift the press bar

3. Insert recording paper into the paper entry, as Figure 2-6 shows.

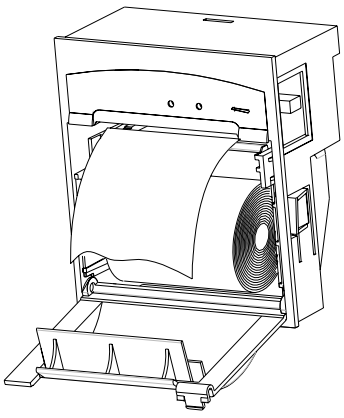


Figure 2-6 Load recording paper

4. Push the press bar back and close the recorder door, as Figure 2-7 shows.

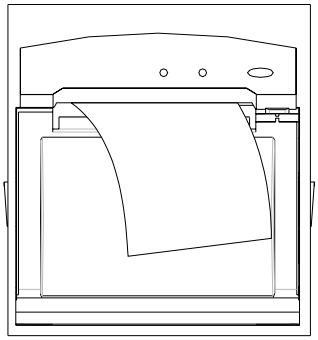


Figure 2-7 Close recorder door

2.5 Installing Printer

If your analyzer is equipped with a printer, use the printer cable to connect it to the interface marked **PARELLEL** on the left of this analyzer.
See the printer's user's manual for installation details.

2.6 Installing Scanner (optional)

The **COM1** of the BC-2800 is reserved for the bar-code scanner. If your analyzer is equipped with the scanner, follow the scanner's operation manual to connect it to the BC-2800

You need to set the scanner if it is your first time using it. The settings will be saved to the system and you only have to set it once. Refer to the scanner's operation instruction to set the **Baud rate** to 9600, **Data bit** to BIT 8, **Parity** to EVEN and **Handshaking** to NONE.

Chapter 3 **Sample Analysis**

This section covers:

- Preparing to start
- Power-up
- Entering ***Count*** Screen
- Entering Sample Information
- Preparing Samples
- Sample Analysis
- Background check
- Shutdown

3.1 Preparing to Start

Before turning on this analyzer, you must perform the following checks to make sure that it is ready to run.

3.1.1 Checking Reagents

Refer to Table 3-1 and make sure there are enough reagents for the upcoming operation of this analyzer.

Table 3-1 Table of reagent consumption

	Diluent	Rinse	Lyse	E-Z Cleanser
For one normal startup procedure (tubing cleaning + background check(s))	46.5ml（tubing cleaning＋1 background check）	16.5ml	0.5ml	
	75ml（tubing cleaning＋2 background checks）	26ml	1ml	
For one sample analysis（WB-All mode）	28.5ml	9.5ml	0.5ml	
For one sample analysis（PB-All mode）	30.5ml（including the 1.6 ml to predilute the sample）	9.5ml	0.36ml	
For one normal shutdown	13.5ml	5.5 ml		1ml

3.1.2 **Checking Waste Container**

You should prepare a container to receive the waste discharged by this analyzer. Be sure to empty the container after every time you ***Shutdown*** this analyzer.

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

WARNING

Handle and dispose of the waste according to acceptable laboratory, local state and national standards.

3.1.3 Checking Tubing and Power Supply

Check the diluent, rinse, lyse and waste tubing and make sure they have no bends and are well connected to this analyzer.

Check the power plug of BC-2800 and make sure it is well plugged into a power socket.

3.1.4 Checking Recorder and Printer (optional)

Check and make sure there is enough paper installed on the built-in recorder and/or the external printer (if connected). Check and make sure the printer's power plug is well plugged into a power socket and is properly connected to BC-2800.

3.1.5 Checking Keyboard (optional)

You need a keyboard to enter complicated information such as patient names, department names and the like. Make sure the keyboard is well connected to the keyboard interface (marked KB) on the left side of BC-2800.

3.2 Power-up

1. Turn on BC-2800 by pressing the power switch on the back and the power indicator will go on.
2. It takes about 80 seconds for this analyzer complete the initialization process, during which the screen displays ***Initialize.***
3. The screen displays the initialization picture and this analyzer performs one of the power-up procedures presented in Table 3-2, depending on the previous shutdown procedure.

Table 3-2 Power-up procedure

Previous shutdown	Power-up procedure
Normal shutdown	Performing the startup procedure
Abnormal shutdown（due to power failure or skipping the proper shutdown procedure）	Resetting the motors, checking the file system, and performing the startup procedure
Shutdown after the ***Prepare to ship*** procedure was done or after the tubing was drained.	Priming the tubing, cleaning the tubing repeatedly and performing the background check.

4. When the power-up procedure is over, the system automatically enters the ***Count*** screen. If any error occurs during the power-up procedure, the corresponding error message will be displayed at the lower left corner of the screen. If you want to access the ***Count*** screen from other screens, follow the steps introduced in section 3.3 **Entering Count Screen** to do so.

3.3 Entering Count Screen

Press [MENU] to enter the system menu. Press the appropriate arrow keys ([↑][↓] [←][→]) to move the cursor to ***Count*** as Figure 3-1 shows.

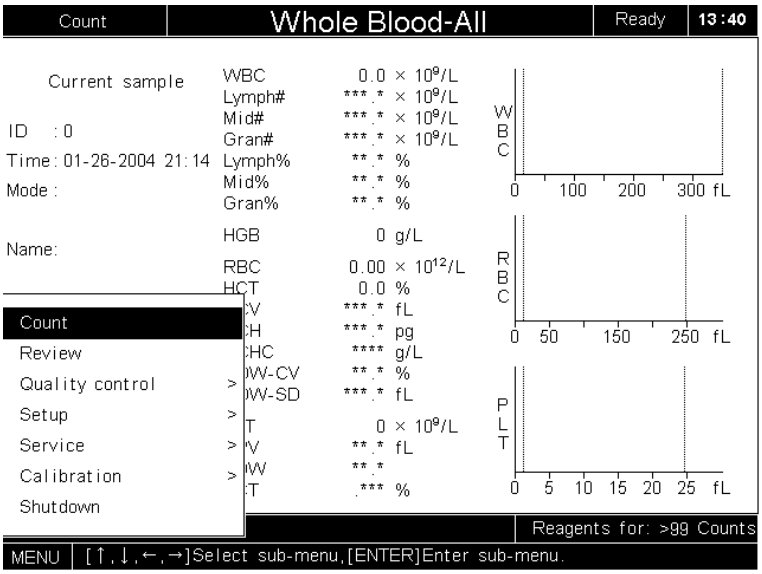


Figure 3-1 Entering Count screen from the system menu

Press [ENTER] to enter the ***Count*** screen, as Figure 3-2 shows.

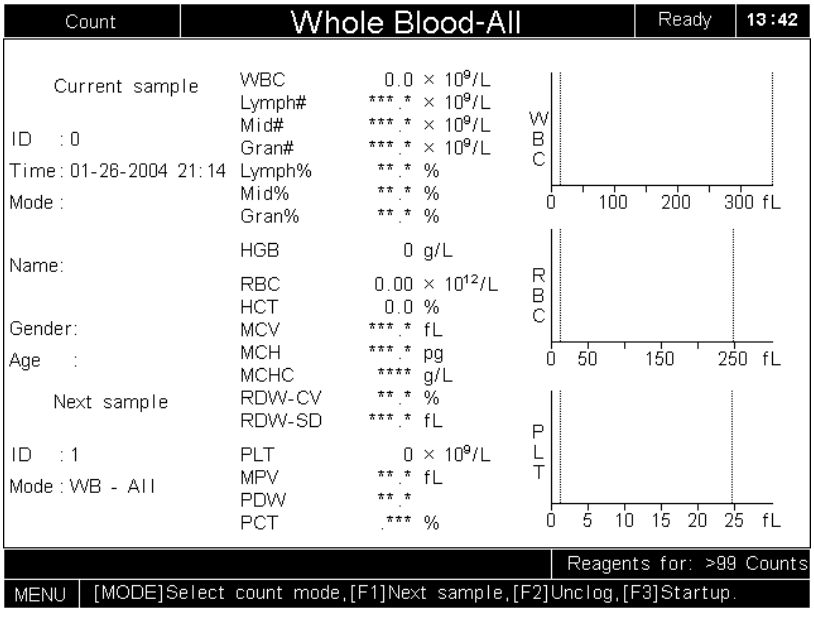


Figure 3-2 Count screen

3.3.1 **Title Area**

The **Title** area displays the title of the current screen, which, in case of Figure 3-2, is ***Count.***

3.3.2 Count Mode Area

The **Count Mode** area displays in which analysis (count) mode the next sample is to be analyzed. In the case of Figure 3-2, the next sample is to be analyzed in the **WB-All** mode (see section 3.6.1 **Selecting Analysis Mode** for detailed information).

3.3.3 System Status Area

The **System Status** area displays whether this analyzer is ready for the next analysis. When it displays ***Ready*** (as in Figure 3-2), it means this analyzer is ready and you can proceed to analyze the next sample. When it displays ***Waiting***, it means this analyzer is still preparing for the next analysis. When it displays ***Running***, it means this analyzer is analyzing a sample.

3.3.4 System Time Area

The **System Time** area displays the system time (in the 24-hour format).

3.3.5 Sample Information Area

The **Sample Information** area has two sub-areas, the upper titled ***Current sample*** and the lower ***Next sample.***

The ***Current sample*** refers to the sample, whose analysis result is displayed on the ***Count*** screen. Its sample ID, time of analysis, analysis mode, and patient information (name, gender and age) are respectively displayed in the ***ID***, ***Time***, ***Mode***, ***Name***, ***Gender*** and ***Age*** fields of the ***Current sample*** sub-area.

The ***Next Sample*** refers to the sample to be analyzed next. Its sample ID and analysis mode are respectively displayed in the ***ID*** and ***Mode*** fields of the ***Next sample*** part.

3.3.6 Analysis Result Area

The **Analysis Result** area displays the analysis result, including histograms, of the current sample.

3.3.7 Error Message Area

The **Error Message** area displays error messages one by one, switching every two seconds.

3.3.8 Reagents Status Area

The **Reagents Status** area displays how many counts the remaining reagents are enough for. Note that when it displays ***99 counts*****,** it indicates both the reagents are enough for over 99 counts and there is also enough space left in the waste container for the counts; when it displays ***0 counts,*** it indicates either at least one of the reagents is insufficient or the waste container is full.

3.3.9 Menu Area

When you press [MENU], this area displays the system menu.

3.3.10 Help Area

The **Help** area reminds you how to proceed to the next step.

3.4 Entering Sample Information

You may enter sample information in any of the three modes, **ID only, All info** and **Batch edit**, depending on the configuration of your analyzer. Note that the **All info** mode cannot co-exist with the other two modes.

3.4.1 ID Only Mode

If your analyzer is configured as **ID only**, it means you can only enter the sample IDs into this analyzer. Follow either of the ways given below to do so.

1. If you have a barcode scanner connected to your analyzer, you may enter the bar-coded sample ID at the ***Count*** screen or the ***Next sample*** screen simply by presenting the bar code to the scanner (see the user's manual of the scanner for more details). The scanner buzzes when the scanning is done.

2. If the bar-code scanner is not available, you may follow the steps given below to enter the sample ID from the keypad or external keyboard.

   - At the ***Count*** screen, press [F1] to enter the ***Next sample*** screen, as Figure 3-3 shows.

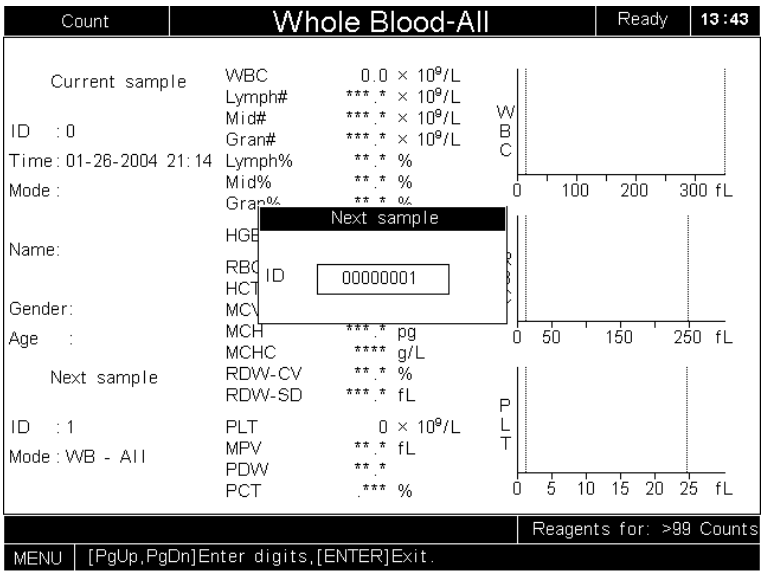


Figure 3-3 Entering ID of the next sample

- Press [←] or [→] to move the cursor within the edit box right of ***ID***. Press [PgUp] or [PgDn] (or the numeric keys on a keyboard) to enter a digit at the position where the cursor is located.

- When you are done entering the sample ID, press [ENTER] to save the changes and the entered number will be displayed in the ***ID* field** of the ***Next sample*** area of the ***Count*** screen. If you want to ignore the entered number, for any reason, you may

press [MENU] and a dialog box will pop up, as Figure3-4 shows. To ignore the entered number, move the cursor to ***No*** and press [ENTER]; otherwise, move the cursor to ***Yes*** and press [ENTER].

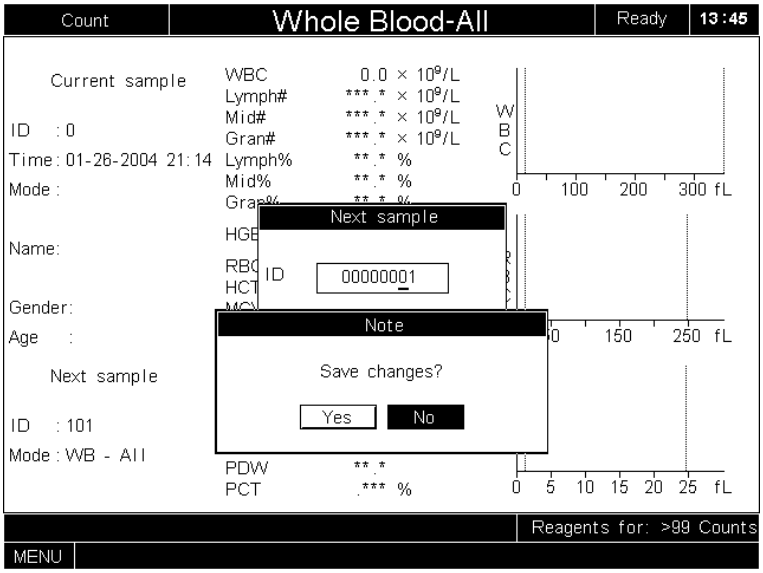


Figure3-4 Dialog box

Note

When the ID of the next sample is 0 and you have pushed the [START] key, the system will perform the background check.

3.4.2 All Info Mode

If you analyzer is configured as **All info**, it means you can enter all pieces of information regarding the sample (patient name, chart number and the like) into this analyzer. To enter them, press [F1] at the ***Count*** screen to enter the ***Enter sample information*** screen, as Figure 3-5 shows. Follow the instructions given below to fill out the listed fields one by one.

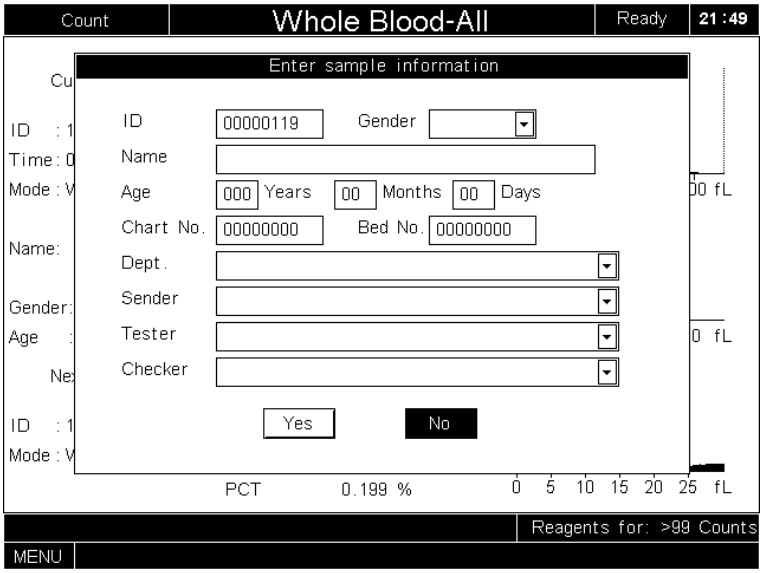


Figure 3-5 Entering sample information

1. To enter the sample ID, you may

   A. Press [↑] or [↓] to move the cursor to the edit box right of ***ID***, as Figure 3-5 shows.

   B. Press [←] or [→] to move the cursor within the edit box. Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located. To modify an entered digit, you can move the cursor to the corresponding location and re-enter the desired digit. If a bar-code scanner is available, you present the bar code to the scanner and the scanner buzzes when the scanning is done.

   C. When you are done entering the sample ID, press [↑] or [↓] to move the cursor to the next field to be edited.

2. To enter the gender of the patient, you may

   A. Press [↑] or [↓] to move the cursor to the edit box right of ***Gender***, as Figure3-6 shows.

   B. Press [ENTER] to display the pull-down menu, as Figure3-6 shows.

   C. Press [↑] or [↓] to select ***Male*** for the male patient, or ***Female*** for the female patient, or blank for the patient whose sex you are unaware of.

   D. Press [ENTER] to confirm the selection.

   E. Press [↑] or [↓] to move the cursor to the next field to be edited.

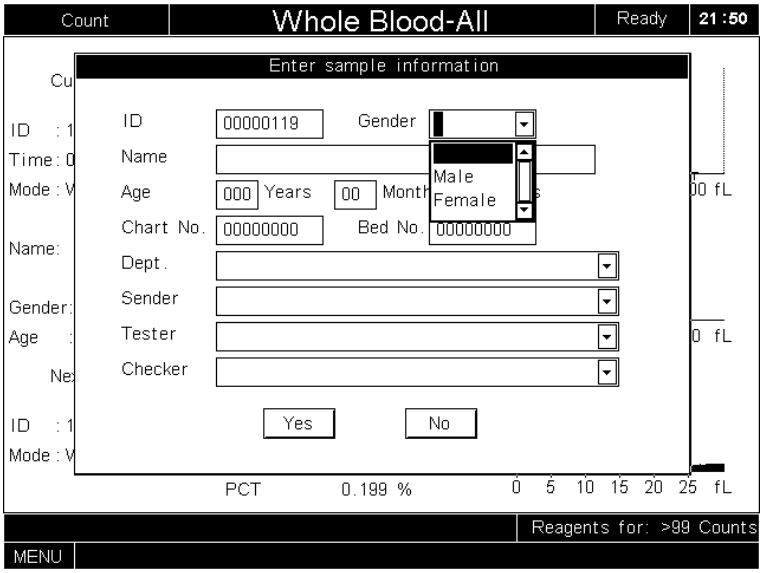


Figure3-6 Select Gender

3. To enter the patient name, you may

   A. Press [↑] or [↓] to move the cursor the edit box right of ***Name***

   B. Use a keyboard to enter the patient name. Press [DEL] if you want to delete the character after the cursor. Press [Backspace] (on the external keyboard), if you want to delete the character before the cursor.

   C. When you are done entering the patient name, press [↑] or [↓] to move the cursor to the next field to be edited.

4. To enter the patient age

Before entering the patient's age, you should know that this analyzer provides three ways for you to do so - entering the age in years, in months and in days. The first way is designed for the adult patients or pediatric patients no younger than one-year old; the second is designed for the infant patients older than one month old (including one month) and younger than one year old; the third is designed for the neonatal patients no more than one month old. You can choose only one of the three ways to enter the patient age.

   A. To enter the patient age in years, you may

      a. Press [↑] or [↓] to move the cursor to the edit box left of ***Year***.

      b. Press [←] or [→] to move the cursor within the edit box. Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located. To modify an entered digit, you can move the cursor to the corresponding location and re-enter the desired digit. Note that you can only enter a positive integer no greater than 255 in this edit box.

      c. When you are done entering the patient age, press [↑] or [↓] to move the cursor to the next field to be edited.

B. To enter the patient in months, you may

a. Press [↑] or [↓] to move the cursor to the edit box left of ***Month***.

b. Press [←] or [→] to move the cursor within the edit box. Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located. To modify an entered digit, you can move the cursor to the corresponding location and re-enter the desired digit. Note that you can only enter a positive integer no greater than 12 in this edit box.

c. When you are done entering the patient age, press [↑] or [↓] to move the cursor to the next field to be edited.

C. To enter the patient age in days, you may

a. Press [↑] or [↓] to move the cursor to the edit box left of ***Day***.

b. Press [←] or [→] to move the cursor within the edit box. Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located. To modify an entered digit, you can move the cursor to the corresponding location and re-enter the desired digit. Note that you can only enter a positive integer that is no greater than 31 in this edit box.

c. When you are done entering the patient age, press [↑] or [↓] to move the cursor to the next field to be edited.

5. To enter the chart number of the patient, you may

A. Press [↑] or [↓] to move the cursor to the edit box right of ***Chart No.***.

B. Press [←] or [→] to move the cursor within the edit box. Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located. If you want to modify an entered digit, just move the cursor to that position and enter the desired digit.

C. When you are done entering the chart number, press [↑] or [↓] to move the cursor to the next field to be edited.

6. To enter the bed number of the patient, you may

A. Press [↑] or [↓] to move the cursor to the edit box right of ***Bed No.***.

B. Press [←] or [→] to move the cursor within the edit box. Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located. If you want to modify an entered digit, just move the cursor to that position and enter the desired digit.

C. When you are done entering the bed number, press [↑] or [↓] to move the cursor to the

next field to be edited.

7. To enter the name of the department from which the sample came, you may

   A. Press [↑] or [↓] to move the cursor to the edit box right of ***Dept.***

   B. Use a keyboard to enter the name of the department (similar to the way you enter patient names). This edit box automatically saves the entered item to its pull-down menu (Figure3-7), which can be accessed by pressing [ENTER]. Totally 30 items can be saved in the pull-down menu, and you may press [↑] or [↓] to move the cursor to the interested item and press [ENTER] to select it.

   C. When you are done entering the department name, press [↑] or [↓] to move the cursor to the next filed to be edited.

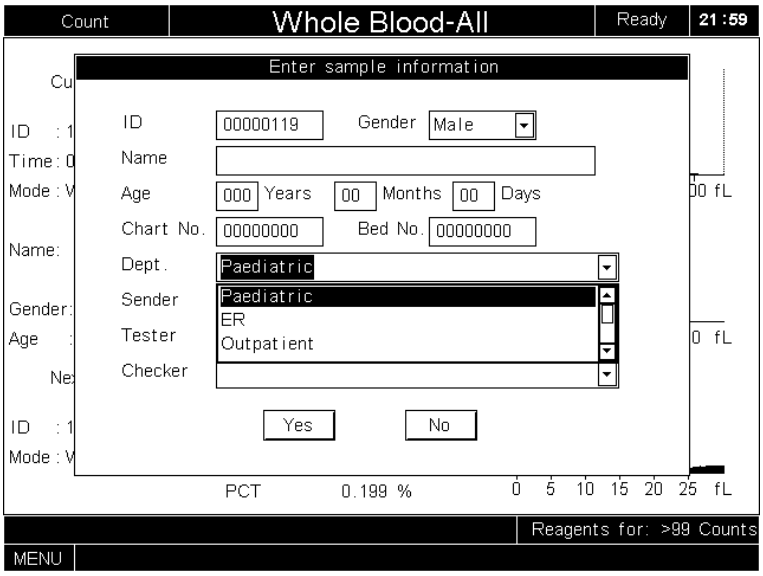


Figure3-7　Select department name

8. To enter the name of the person who sent the sample for analysis, you may

   A. Press [↑] or [↓] to move the cursor the edit box right of ***Sender.***

   B. Use a keyboard to enter the name of the person who sent this sample. This edit box automatically saves the entered item to its pull-down menu, which can be accessed by pressing [ENTER]. Totally 30 items can be saved in the pull-down menu, and you may press [↑] or [↓] to move the cursor to the interested item and press [ENTER] to select it.

   C. When you are done entering the name, press [↑] or [↓] to move the cursor to the next field to be edited.

9. To enter the name of the person who is to analyze the sample, you may

   A. Press [↑] or [↓] to move the cursor the edit box right of Tester.

   B. Use a keyboard to enter the name of the person who is to test this sample. This edit

box automatically saves the entered item to its pull-down menu, which can be accessed by pressing [ENTER]. Totally 30 items can be saved in the pull-down menu, and you may press [↑] or [↓] to move the cursor to the interested item and press [ENTER] to select it.

C. When you are done entering the name, press [↑] or [↓] to move the cursor to the next field to be edited.

10. To enter the name of the person who is to review the analysis result, you may

A. Press [↑] or [↓] to move the cursor the edit box right of ***Checker***.

B. Use a keyboard to enter the name of the person who is to review this sample. This edit box automatically saves the entered item to its pull-down menu, which can be accessed by pressing [ENTER]. Totally 30 items can be saved in the pull-down menu, and you may press [↑] or [↓] to move the cursor to the interested item and press [ENTER] to select it.

C. When you are done entering the name, press [↑] or [↓] to move the cursor to the next field to be edited.

11. When you are done entering the patient information, you may

A. Move the cursor to ***Yes*** and press [ENTER] to save the changes and exit to the ***Count*** screen, or

B. Move the cursor to ***No*** and press [ENTER] to exit to the ***Count*** screen without saving the changes.

3.4.3 Batch Edit Mode

If your analyzer is configured as **Batch edit**, you can continuously enter information of a batch of samples. Follow the steps given below to do so.

1. At the ***Count*** screen, press [F4] to enter the **Batch edit** screen, as Figure 3-8 shows.

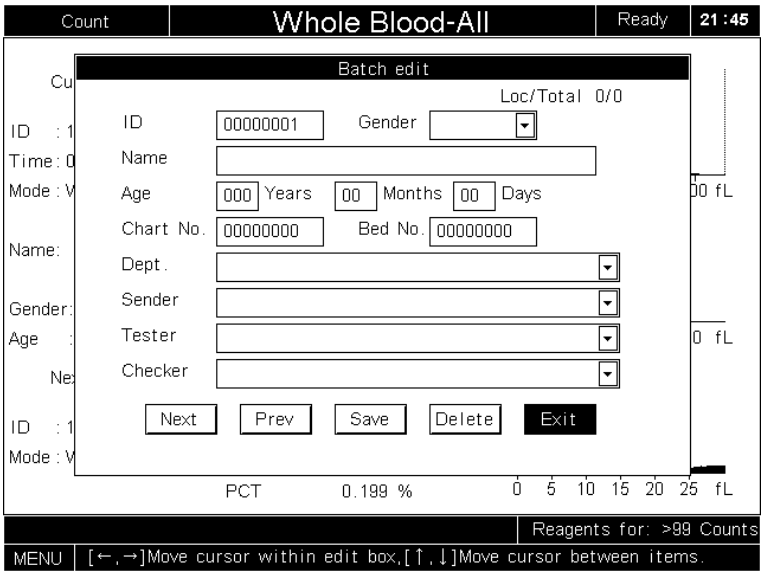


Figure 3-8 Batch edit screen

2. Follow the instructions given in section 3.4.2 **All Info Mode** to enter the information of the first sample.

3. Press the appropriate arrow keys to move the cursor to ***Save*** and press [ENTER] to save the changes.

4. Repeat the last two steps until you are done with the batch.

5. If you want to review the entered information of a specific sample, press the appropriate arrow keys to move the cursor to ***Prev.*** or ***Next*** and press [ENTER] to review the information of the previous or next sample until the desired sample is reached.

6. If you want to delete the currently displayed sample information, press the appropriate arrow keys to move the cursor to ***Delete*** and press [ENTER] to complete the deletion.

7. When you are done with the batch, press the appropriate arrow keys to move the cursor to ***Exit*** and press [ENTER] to exit to the ***Count*** screen. After a sample is analyzed, its corresponding sample information will be automatically displayed in the ***Current sample*** area.

3.5 Preparing Samples

BC-2800 is capable of analyzing two types of samples - whole blood samples and prediluted samples.

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Cautions

Avoid direct contact with blood specimens.

3.5.1 Preparing Whole Blood Samples

Mindray recommends BC-2800 be used to analyze the whole blood samples that use K_2EDTA as the anticoagulant. The demanded dose of the anticoagulant is 1.5 ~ 2.2mg/ml blood.

3.5.2 Preparing Prediluted Samples

1. Press [MODE] to select the prediluted mode (any mode preceded by **PB**).
2. Press [DILUENT] to enter the ***Add Diluent*** screen, as Figure 3-9 shows.

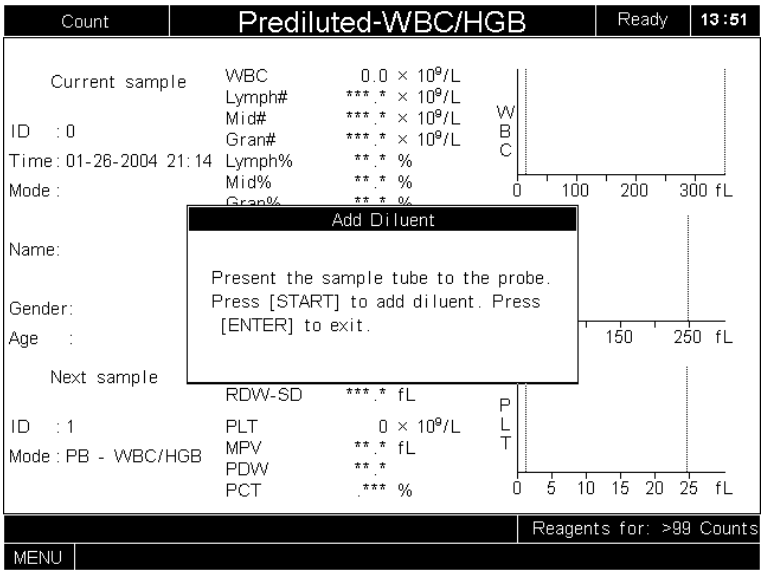


Figure 3-9 Add Diluent screen

3. Present a clean sample cup to the sample probe and press [START] to add 1.6ml diluent (controlled by the analyzer itself) to the cup. Be sure to incline the cup at the angle shown in Figure 3-10, to force the diluent to flow into the cup against the cup wall so that no bubbles will be produced during the process.

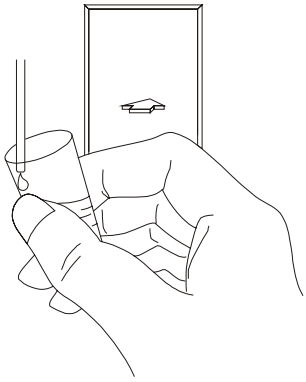


Figure 3-10 Adding diluent

4. Remove the sample cup when the sample probe has risen up and press [ENTER] to exit the Add Diluent screen.

5. Collect 20μL capillary blood specimen and immediately add it to the sample cup and shake to mix them.

6. Pay particular attention to the following notes.

A. When you are done mixing the prediluted sample (capillary blood-diluent mixture), be sure to wait for 3 minutes before analyze it.

B. When you are done mixing the prediluted sample, be sure to analyze it within 40 minutes if you want to acquire reliable WBC differential results.

C. If you are not interested in the differential result, you can analyze the prediluted sample within two hours after it is ready.

D. Be sure to prevent dusts from falling into the prepared diluent. Otherwise, you may acquire misleading result.

E. The precision of the analysis results of the prediluted samples vary depending on the operators. Mindray recommends every laboratory evaluate the stability of the results based on its sample quantity and collection method.

3.6 Sample Analysis

To keep this analyzer precise, be sure to run the QC program every day before beginning sample analysis. See chapter 4, **Quality Control**, for details.

3.6.1 Analyzing Samples

3.6.1.1 Selecting Analysis Mode

At the ***Count*** screen, press [MODE] to select one of the six analysis modes. The selected mode will be displayed in the **Count Mode** area.

1. WB-All

It stands for the **Whole Blood - All Parameter** mode, meaning the sample to be analyzed is a whole blood sample and all the 19 parameters are to be analyzed.

2. WB- WBC/HGB

It stands for the **Whole Blood - WBC/HGB Group** mode, meaning the sample to be analyzed is a whole blood sample and only the following parameters are analyzed: WBC, Lymph#, Mid#, Gran#, Lymph%, Mid%, Gran% and HGB, plus the WBC histogram.

3. WB-RBC/PLG

It stands for the **Whole Blood – RBC/PLC Group** mode, meaning the sample to be analyzed is a whole blood sample and only the following parameters are analyzed: RBC, HCT, MCV, MCH, MCHC, RDW-CV, RDW-SD, PLT, MPV, PDW and PCT, plus the RBC and PLT histograms.

4. PB-All

It stands for the **Prediluted Blood - All Parameter** mode, meaning the sample to be analyzed is a prediluted blood sample and all the 19 parameters are to be analyzed, plus 3 histograms.

5. PB- WBC/HGB

It stands for the **Prediluted Blood - WBC/HGB Group** mode, meaning the sample to be analyzed is a whole blood sample and only the following parameters are analyzed: WBC, Lymph#, Mid#, Gran#, Lymph%, Mid%, Gran% and HGB, plus the WBC histogram.

6. PB-RBC/PLG

It stands for the Prediluted Blood – RBC/PLC Group mode, meaning the sample to be analyzed is a prediluted blood sample and only the following parameters are analyzed: RBC, HCT, MCV, MCH, MCHC, RDW-CV, RDW-SD, PLT, MPV, PDW and PCT, plus the RBC and PLT histograms.

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Warning

The probe is sharp and may contain biohazard materials, including controls and calibrators. Avoid any unnecessary contact with the probe and probe area.

Note

To have an accurate aspiration, be sure to keep certain distance between the probe and the bottle bottom during the aspirating process.

3.6.1.2 Analyzing Whole Blood Samples

Follow the steps given below to analyze a whole blood sample.

1. Press [MODE] to select the appropriate analysis mode.
2. Present the whole blood sample to the sample probe. Press [START] and the probe will automatically aspirate 13 μl sample.
3. Remove the sample when aspiration is done (when the analyzer buzzes) and the sample probe has risen up.
4. Wait for the analyzer to finish the analyzing process, during which the center of the screen displays the analyzing progress and the **System Status Area** displays ***Running.*** When the analysis is done, the result is displayed in the **Analysis Result Area,** and the ***ID*** in the ***Next sample*** area automatically increases by one.

3.6.1.3 Analyzing Prediluted Blood Samples

Follow the steps given below to analyze a prediluted blood sample.

1. Press [MODE] to select the appropriate analysis mode.
2. Present the prediluted blood sample to the sample probe. Press [START] and the probe will automatically aspirate 0.7ml sample.
3. Remove the sample when aspiration is done (when the analyzer buzzes) and the sample probe has risen up.
4. Wait for the analyzer to finish the analyzing process, during which the center of the screen displays the analyzing progress and the **System Status** area displays ***Running.*** When the

analysis is done, the result is displayed in the **Analysis Result** area, and the **ID** in the **Next Sample Part** automatically increases by one.

3.6.1.4 Printing Analysis Results

You can print out the displayed analysis result either automatically or manually. If you want to print out the analysis result automatically, refer to section 7.2.2, **Printing and Transmission**, to set the ***Autoprint*** to ***On*** and select the built-in recorder or the external printer as the printing device. The analysis result will be automatically printed out to the selected device when the analysis is done. If you want to print out the analysis results manually, set the ***Autoprint*** to ***Off*** and press [PRINT] at the ***Count*** screen to print out the displayed analysis result to the selected printing device. Note that when you enable the ***Autoprint*** function, make sure there is enough printing paper in the recorder or printer.

3.6.1.5 Recount

If the system detects clog or bubbles during the analysis, or you press [F5] ,a dialog box will pop up to ask you whether you want to have a re-count (analyze this sample again), as Figure 3-11 shows.

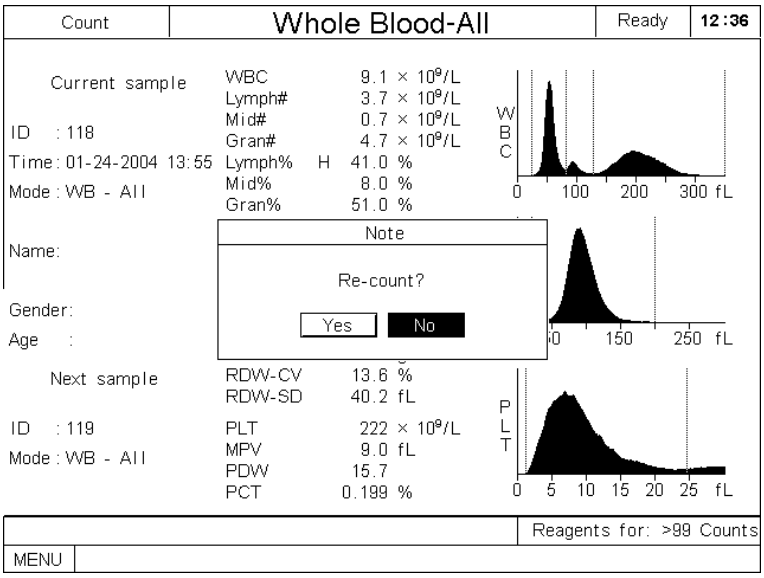


Figure 3-11 Re-count dialog box

If you want to re-analyze this sample, move the cursor to ***Yes*** and press [ENTER] to enter the ***Recount*** screen; otherwise, move the cursor to ***No*** and press [ENTER]. This ***Recount*** screen is similar to the ***Count*** screen, except the lower sub-area of the **Sample Information** area is tiled ***Recount*** as opposed to ***Next sample***. The sample ID remains unchanged.
Follow the previously introduced procedure to re-analyze the sample in question. The new result will overwrite the old result while the sample information keeps unchanged.

3.6.1.6 Saving Analysis Results

This analyzer automatically saves the analysis results to its internal memory. When the

memory is full, the oldest result will be automatically covered by the newest one.

3.6.2 Operation Range of Sample Results

Refer to Table 3-3 for the upper limit of the operation (or printing) range of the analysis.

Table 3-3 Upper limit of operation range

Parameter	Upper limit of the operation (or printing) range	Parameter	Upper limit of the operation (or printing) range
WBC	499.9×10^9/L	MCV	250.0 fL
Lymph#	499.9×10^9/L	MCH	999.9 pg
Mid#	499.9×10^9/L	MCHC	9999 g/L
Gran#	499.9×10^9/L	RDW-CV	99.9%
Lymph%	99.9%	RDW-SD	250.0fL
Mid%	99.9%	PLT	3000×10^9/L
Gran%	99.9%	PDW	99.9
RBC	9.99×10^{12}/L	MPV	30.0 fL
HGB	300 g/L	PCT	0.70 %
HCT	99.9%		

3.6.3 Parameter Flags

If the analysis result of any parameter exceeds the reference range (see section 7.2.6), you may see the following flags.

If the analysis result is followed by an ***H*** or ***L,*** it means the analysis result has exceeded the upper or lower limit of the reference range.

If you see ******* as opposed to the result, it means the result either unreliable or out of the display range.

If **WBC** result is less than 0.5×10^9/L, this analyzer will not perform the differential analysis and all the related parameter results will be marked *****.**

3.6.4 Histogram Flags

The system will flag abnormal histograms.

1. Abnormal WBC histograms will be flagged by one of the markings: R1，R2，R3，R4 and R_m.

   A. R1：indicates abnormality on the left side of the lymphocyte hump and possible presence of platelets coagulate, large platelet, nucleated red cell, insolvable red cell, protein, lipoid debris in sample, or electrical noise.

   B. R2: indicates abnormality between the lymphocyte hump and the mononuclear area and

possible presence of atypical lymphocyte, original cell in the sample and increased eosinophil or increased basophil.

C. R3：indicates abnormality between the mononuclear leukocyte and the neutrophilic granulocytes and possible presence of immature granulocytes, abnormal sub-population in the sample, or increased eosinophil.

D. R4：indicates abnormality on the right side of the neutrophilic granulocytes hump and increased absolute number of neutrophilic granulocyte.

E. R_m：indicates at least two R flags.

2. Abnormal PLT histograms will be flagged by one of the markings: P_m， P_S and P_L.

A. Pm：indicates blur demarcation between the platelet and red blood cell area and possible presence of large platelet, platelet coagulation, small red blood cell, cell debris or fibrin.

B. P_S：indicates excessive small PLTs.

C. P_L：indicates excessive large PLTs.

3.6.5 Adjusting Histograms Manually

You can adjust the histogram discriminators, if you are unhappy with the current WBC differential or RBC/PLT results. Note that you cannot adjust the discriminators manually if the WBC result is less than 0.5 or out of the operation range.

The first three discriminators of the WBC histogram are adjustable, so are the two of the RBC histogram and the two of the PLT histogram.

Assuming you want to shift the third discriminator of the WBC histogram to 100fL, follow the steps given below to do so.

1. At the ***Count*** screen, press [ENTER] to activate the discriminators, as Figure3-12 shows.

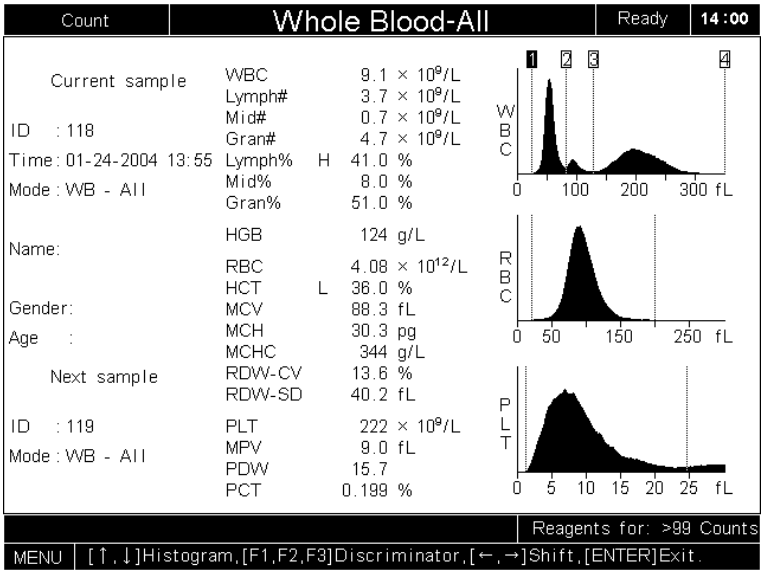


Figure3-12 Activating discriminators

2. Press [↑] or [↓] to select the WBC histogram.
3. Press [F3] to select the third discriminator, as Figure3-13 shows.

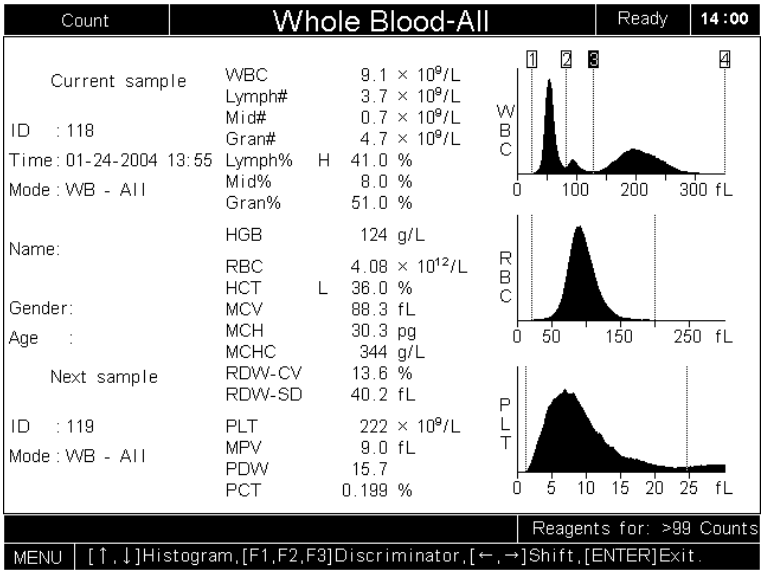


Figure3-13 Adjusting WBC histogram [1]

4. Press [←] to shift the discriminator to 100fL, as Figure3-14 shows.

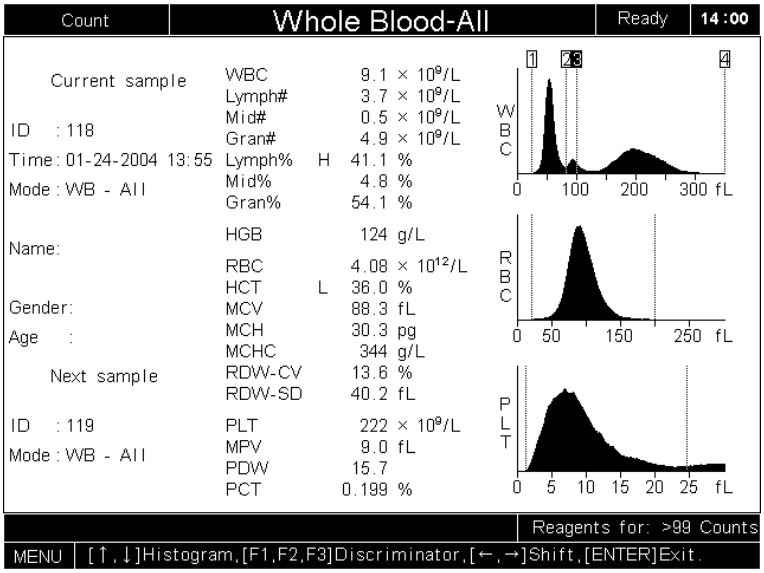


Figure3-14 Adjusting WBC histogram [[2]

5. Press [ENTER] to finish the adjustment and a dialog box will pop up to remind you to save the adjustment, as Figure3-15 shows.

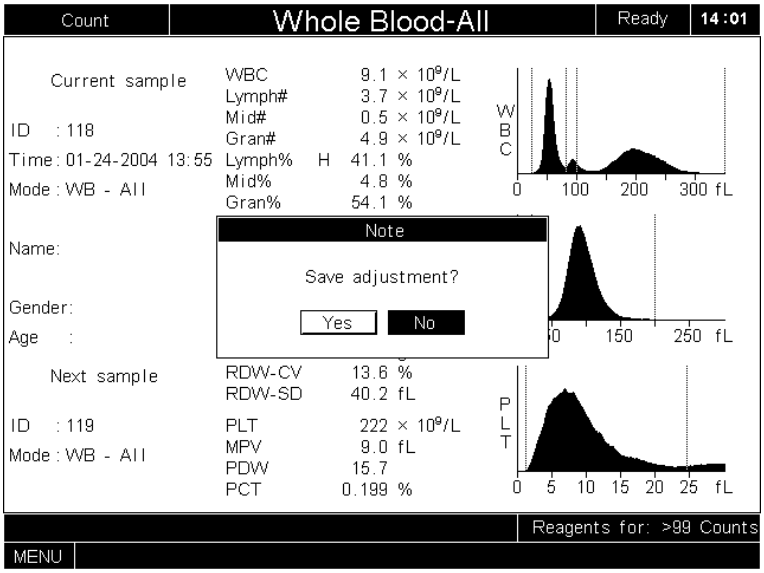


Figure3-15 Saving changes

6. To save the adjustment, move the cursor to ***Yes*** and press [ENTER]; otherwise, move the cursor to ***No*** and press [ENTER].

3.7 Background Check

The system will check the background during the startup procedure or when the ID of the next sample is ***0*** and the [START] key is pressed.

The background check refers to the analysis in which the sample is replaced by the diluent. Result of the background check should meet the following requirements and if not, the system will give an alarm for the ***Background abnormal*** error.

Table 3-4 Background check requirements

Parameter	Expected results
WBC	（≤ 0.3×10^9 / L） and not *** (invalid results)
RBC	（≤ 0.03×10^{12}/ L） and not *** (invalid results)
HGB	（≤ 1 g / L） and not *** (invalid results)
HCT	（≤ 0.5 %） and not *** (invalid results)
PLT	（≤ 7×10^9 / L） and not *** (invalid results)

3.8 Shutdown

Note

To ensure the stability and precision of the analysis results, be sure to shut down the analyzer by the **Shutdown** procedure after it runs continuously for 24 hours.

Follow the steps given below to perform the **Shutdown** procedure:

1. Press [MENU] to enter the system menu and press [↑] or [↓] to move the cursor to ***Shutdown***, as Figure 3-16 shows.

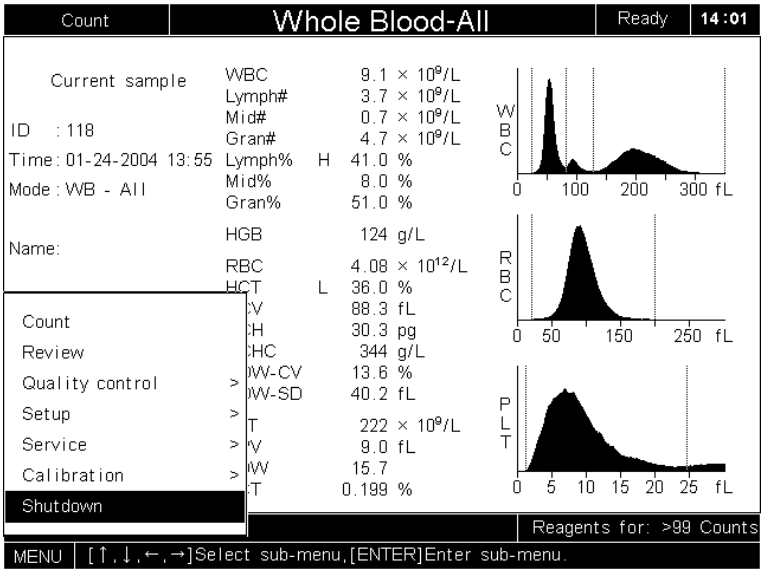


Figure 3-16 Performing the Shutdown procedure from the system menu.

2. Press [ENTER] to enter the Shutdown dialog box., as Figure 3-17 shows.

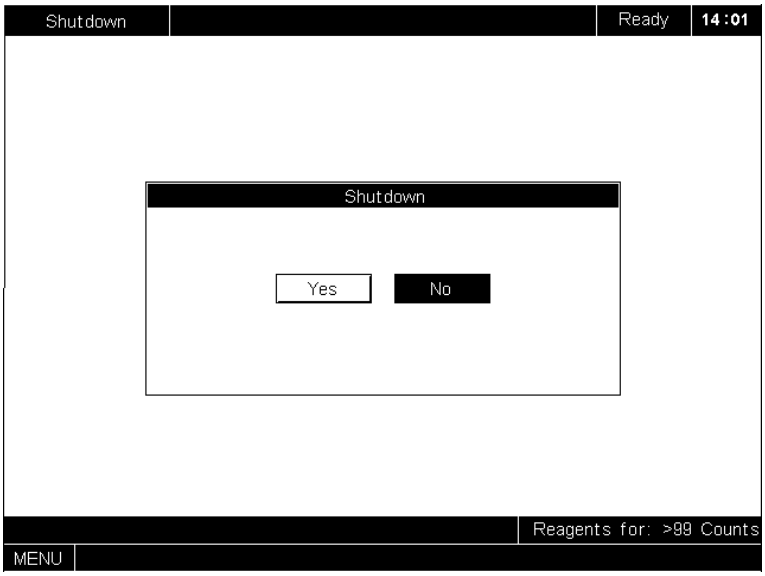


Figure 3-17 Shutdown dialog box

3. To Shutdown this analyzer, move the cursor to ***Yes*** and press [ENTER] to enter the Shutdown screen, as Figure 3-18 ; otherwise, move the cursor to ***No*** and press [ENTER] to exit the dialog box.

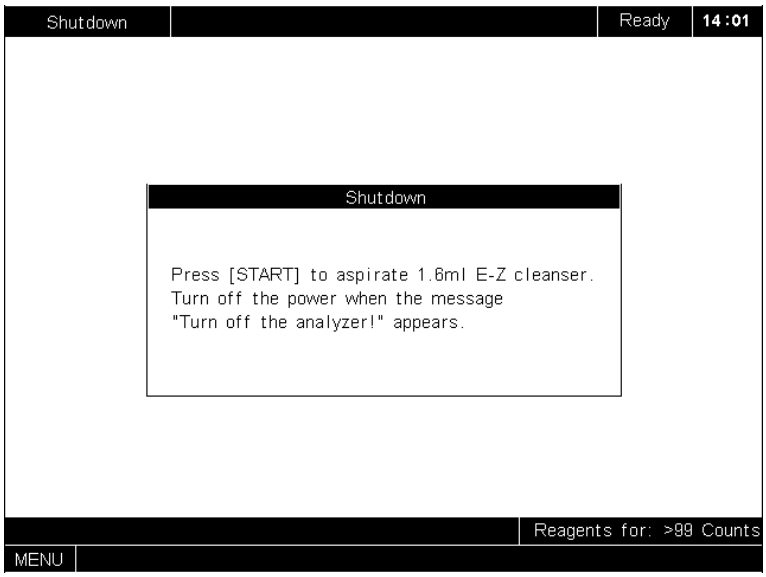


Figure 3-18 Shutdown screen

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Warning

The probe is sharp and may contain biohazard materials, including controls and calibrators. Avoid any unnecessary contact with the probe and probe area.

4. Present the E-Z cleanser to the sample probe and press the [START] key to aspirate 1.6mL cleanser. The screen then displays the count down to turn off the analyzer, as Figure 3-19 shows.

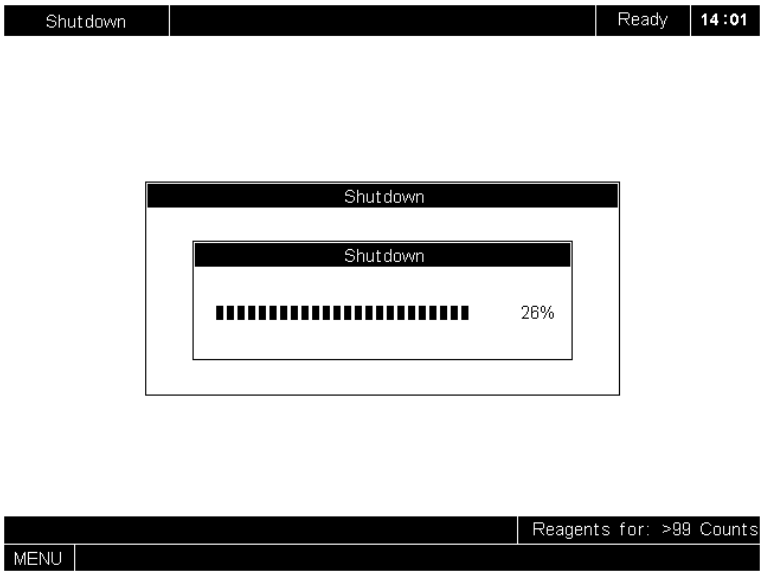


Figure 3-19 Count down to turn off the analyzer

5. When the Shutdown procedure is done, the screen displays ***Turn off the analyzer***. Turn off the analyzer as instructed.

6. Dispose of the waste.

Biohazard

Consider all materials (specimens, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

WARNING

Handle and dispose of the waste according to acceptable laboratory, local state and national standards.

Chapter 4 Quality Control

After being used for a certain period of time, the hematology analyzer is subject to errors, which may lead to misleading or unreliable analysis results. To maintain the accuracy and precision of this analyzer, Mindray recommends that the quality control (QC) program be run daily with controls of low, normal and high levels, provided the user is familiar with the principle and approach of quality control.

This analyzer provides two QC programs – QC with controls and X-B analysis.

4.1 QC with Controls

BC-2800 provides 9 QC files and can include maximum 12 parameters to this QC program.

4.1.1 Entering the Controls Screen

Press [MENU] to enter the system menu. Press the appropriate arrow keys([↑][↓][←][→]) to move the cursor to the ***QC*** → ***Controls***, as Figure 4-1 shows.

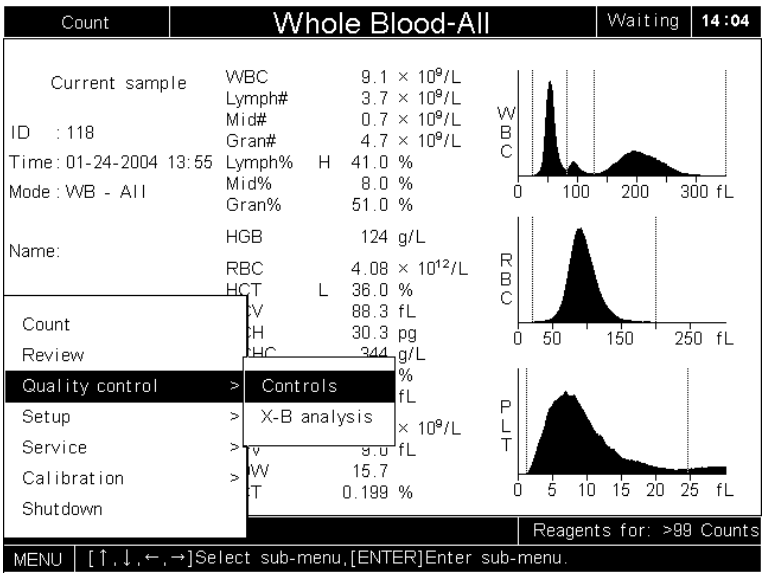


Figure 4-1 Entering the Controls Screen from the system menu

Press [ENTER] to enter the ***Controls*** screen, as Figure 4-2 shows.

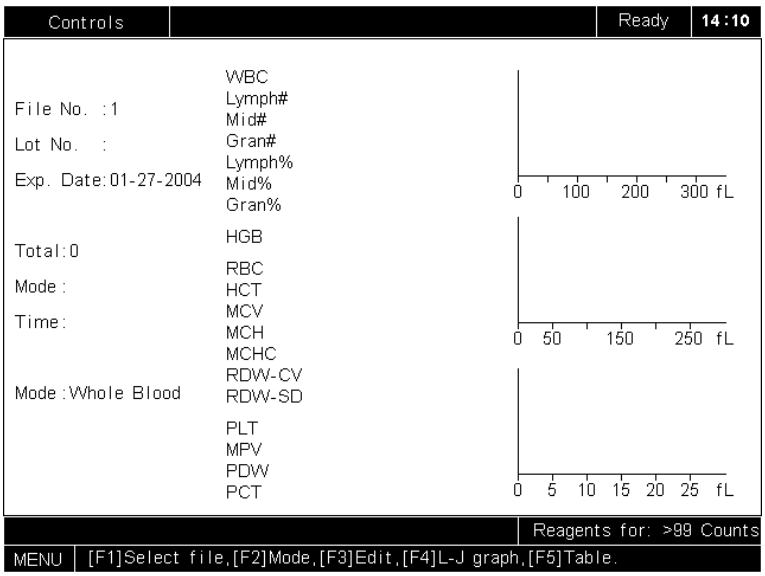


Figure 4-2 Controls Screen

At the screen, if you want to acquire help information, press [HELP]. If you want to delete the

displayed QC result, follow the steps given below:

1. Press [DEL] to enter the dialog box shown in Figure 4-3.

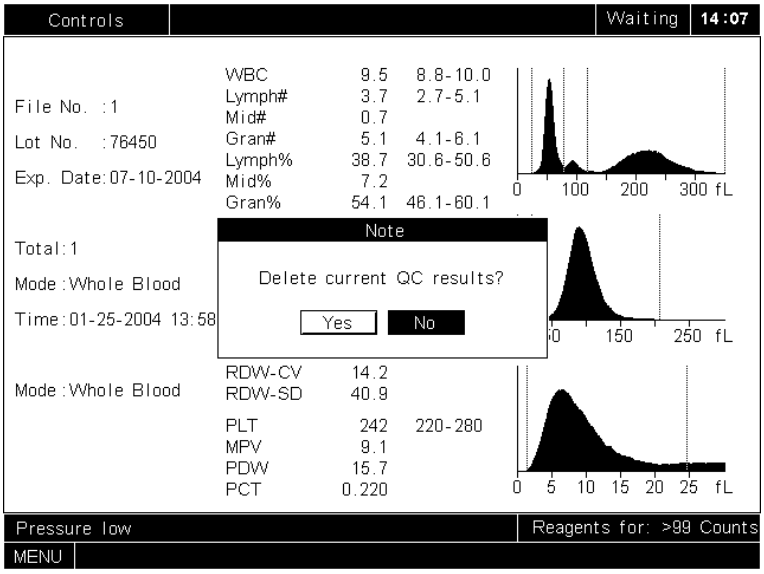


Figure 4-3 Dialog Box to Confirm the Deletion

2. Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] if you want to confirm the deletion.

3. Press [←] or [→] to move the cursor to ***No*** and press [ENTER] if you want to cancel the deletion.

4.1.2 **Selecting a QC File**

This analyzer provides 9 QC files for the user to store the QC settings and results. Press [F1] to select the desired QC file. Each QC file can save the results of maximum 31 QC analyses. When the file is full, the result of the newest run automatically covers that of the oldest.

After selecting the QC file, press [F2] to select the ***Whole Blood*** or ***Prediluted*** mode.

4.1.3 **Editing QC Settings**

Before editing the QC settings, make sure the QC file you have selected is empty. If not, you must follow either of the two ways given below to delete the existing results first.

1. At the ***Controls*** screen, press [DEL] to delete the existing results one by one. Or

2. Go to the ***QC Table*** screen to delete all the existing results once and for all (see section 4.1.5.2 QC Table, for detailed steps).

When you are sure the selected QC file is empty, press [F3] to enter the ***QC Edit*** screen, as Figure 4-4 shows. Follow the instructions given below to edit the lot number and expiration

date for the control material to be used and to assign the mean and expected ranges to the parameters to be included in the upcoming QC analysis. If you press [DEL] at this screen, you will delete all the entered data, and the system will automatically set the current date as the expiration date.

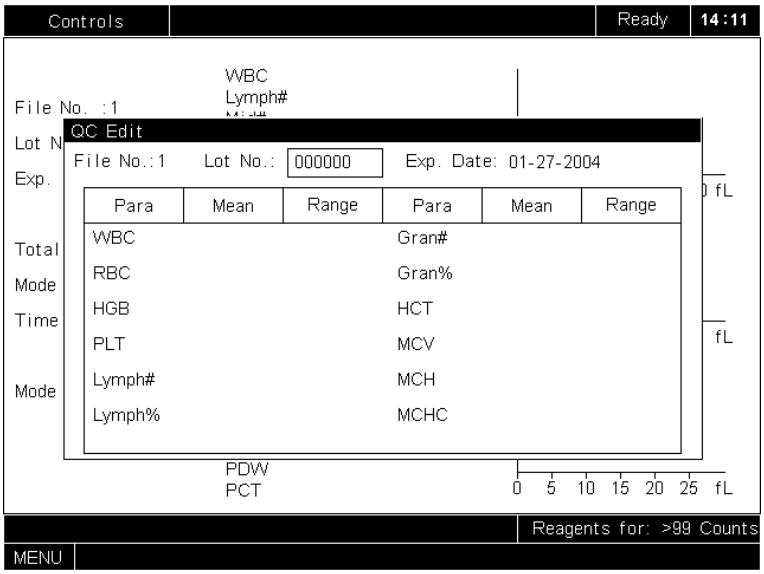


Figure 4-4 QC Edit Screen

1. File Number

The file number of the selected QC file will be displayed in the ***File No.*** field, where you can only view the number without altering it.

2. Entering lot number

You should enter the lot number of the control material to be used for the upcoming QC analysis in the edit box right of ***Lot No.***. Follow the steps given below to do so.

A. Press [↑] or [↓] to move the cursor to the edit box, as Figure 4-5 shows.

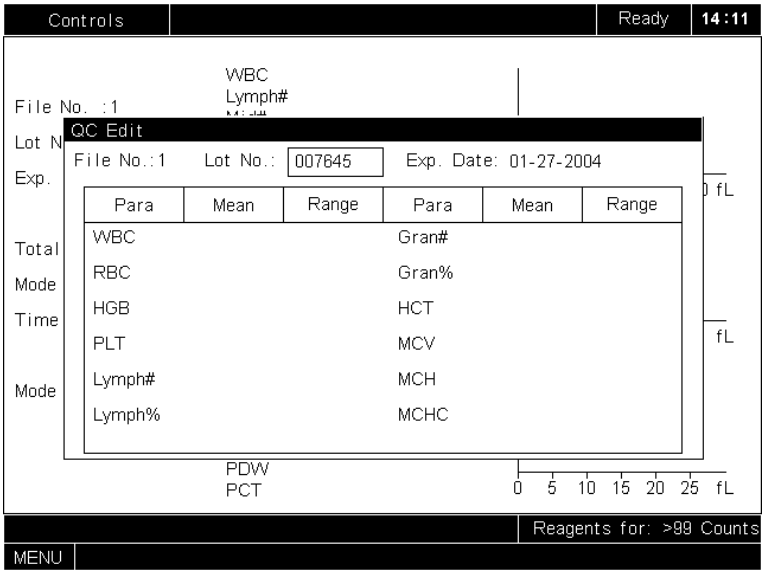


Figure 4-5 Entering ***Lot No.***

B. Press [←] or [→] to move the cursor to the desired position within the box.

C. Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located.

D. To modify a digit at a certain position, just move the cursor to that position and re-enter the desired digit.

E. When you are done entering the lot number, press [↑] or [↓] to move the cursor to the next item to be viewed or edited.

3. Entering expiration date

You should enter the expiration date of the control material to be used for the upcoming QC analysis in the edit box right of ***Exp. Date***. Follow the steps given below to do so.

A. Press [↑] or [↓] to move the cursor to the edit box.

B. Press [PgUp] or [PgDn] to enter the digits for the expiration date in the MM-DD-YYYY format, as Figure 4-6 shows.

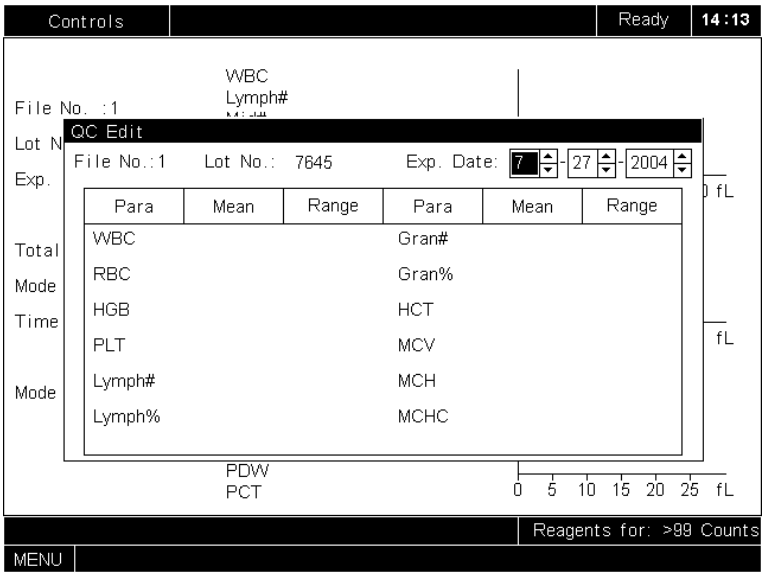


Figure 4-6 Entering ***Exp. Date***

C. When you are done entering the expiration date, press [↑] or [↓] to move the cursor to the next item to be viewed or edited.

4. Entering means and ranges

To include a parameter in the upcoming QC analysis, you should refer to the data sheet of the control material and find the listed mean and range of that parameter and then follow the steps given below to enter them to the ***Mean*** and ***Range*** respectively columns. Follow the steps below to do so.

A. Press [↑] or [↓] to move the cursor to ***Mean*** (or ***Range***) of the parameter to be included in the QC analysis.

B. Press [←] or [→] to move the cursor to the desired position within the column.

C. Press [PgUp] or [PgDn] to enter a digit at the position where the cursor is located, as Figure 4-7 shows. Note that this analyzer adopts a fixed decimal point. Therefore, you can just enter the digits without paying attention to the decimal point.

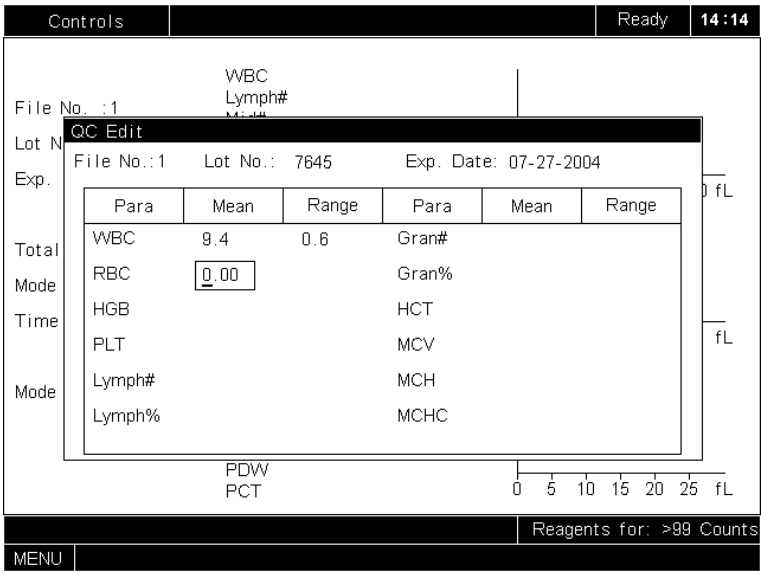


Figure 4-7 Entering ***Mean*** and ***Range***

D. To modify a digit at a certain position, just move the cursor to that position and re-enter the desired digit.

E. When you are done entering the means (or ranges), press [↑] or [↓] to move the cursor to the next item to be viewed or edited. Note that if the entered mean is less than or equal to the entered range, the system, when exiting the ***QC Edit*** screen, will warn the user that the entered values are invalid and automatically clear the corresponding ***Mean*** and ***Range*** columms.

5. Exiting the ***QC Edit*** screen

When you are done editing the QC settings, follow the steps given below to exit the ***QC Edit*** screen.

A. Press [MENU] and a dialog box will pop up to remind the user to save the changes, as Figure 4-8 shows.

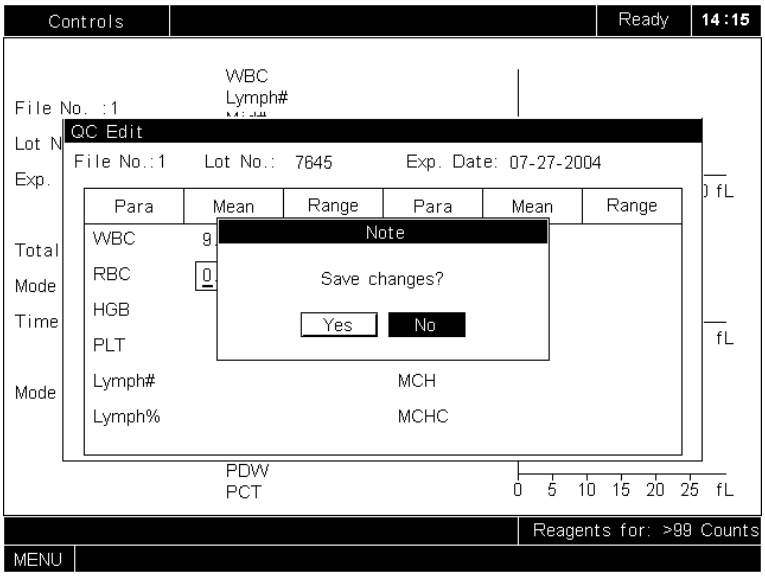


Figure 4-8 Dialog Box to Confirm the Changes

B. To save the changes, move the cursor to ***Yes*** and press [ENTER]; otherwise, move the cursor to ***No*** and press [ENTER]

6. Other operations

A. If you neither entered new settings nor changed the old settings, you may press [MENU] to directly return to the ***Controls*** screen without seeing the dialog box shown in Figure 4-8.

B. If you want to print out the saved **QC settings**, press [PRINT]. Note newly entered or changed settings will not be printed out until they are saved.

C. If you want to acquire help information, press [HELP].

4.1.4 Running QC

Before running the QC program, be sure to read the instructions of the control material to be used and handle it as instructed. Note that the new lot of controls should be analyzed in parallel with the current lot prior to their expiration dates for 4 days.

When you are done handling the control material, treat and analyze it the same as patient samples. Refer to section 2.6, **Sample Analysis,** for detailed operation procedures.

Caution

Mindray demands only the recommended controls be used on the BC-2800 and will not take responsibility for inaccurate results if other controls has bee used on it.

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Warning

The probe is sharp and may contain biohazard materials, including controls and calibrators. Avoid any unnecessary contact with the probe and probe area.

4.1.5 **Reviewing the QC Results**

You can review the saved results in either of the two modes - ***L-J Graph*** and ***Table***.

4.1.5.1 L-J Graph

At the ***Controls*** screen, press [F4] to enter the ***L-J Graph*** screen, as Figure 4-9 shows.

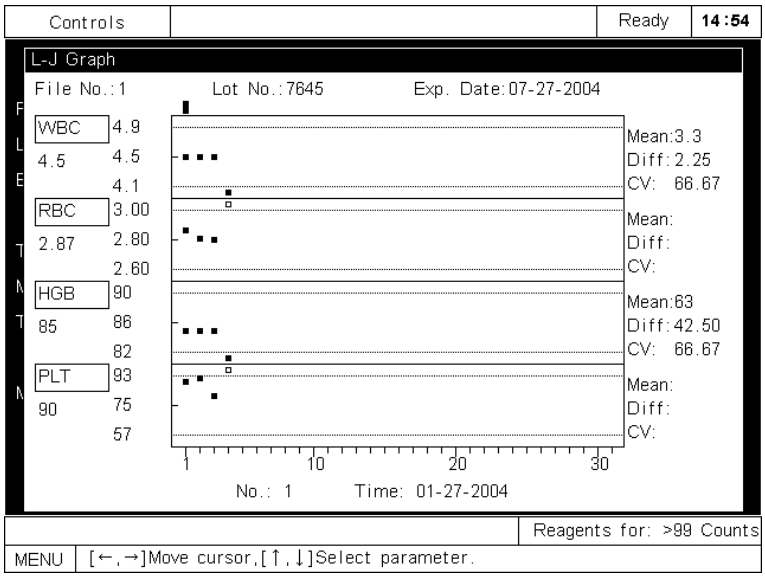


Figure 4-9 L-J Graph Screen (1)

The 12 parameters are divided into 3 groups for display, one group for one screen, as Figure 4-9 – Figure 4-11 shows. You can press [↑] or [↓] to switch among the screens. At every ***L-J Graph*** screen , you can press [←] or [→] to view the results (displayed below the parameter

box) of every point presented in the graph. The current cursor position is displayed in the ***No.*** field and the time at which this QC analysis was done was displayed in the ***Time*** field.

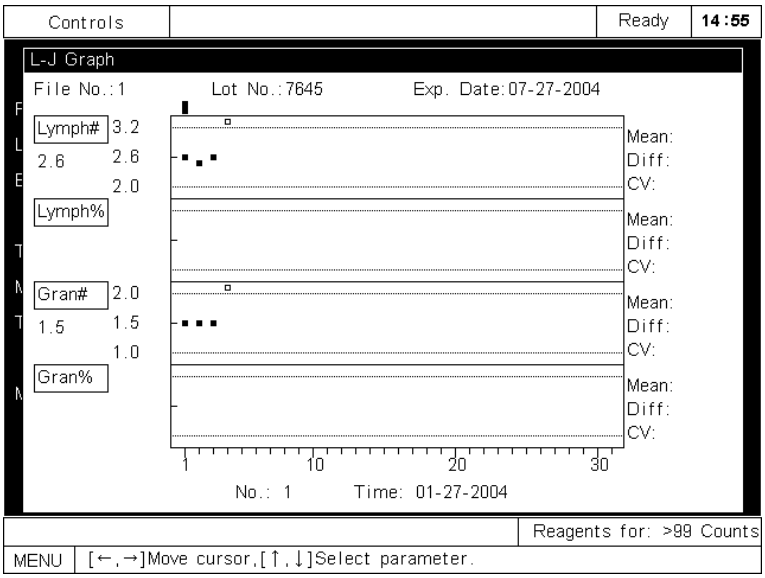


Figure 4-10 L-J Graph Screen (2)

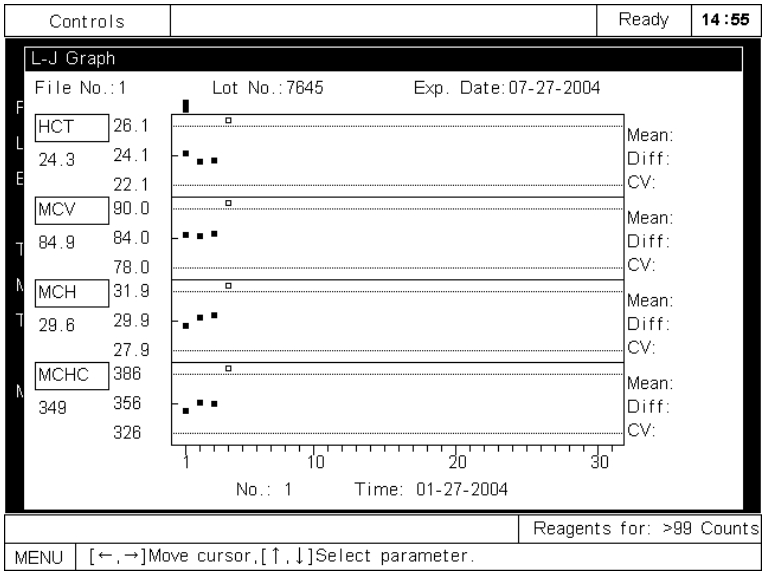


Figure 4-11 L-J Graph Screen (3)

The L-J graph is interpreted as follows:

1. The x-coordinate represents how many times the QC program has been run. The y-coordinate represents the analysis results of the displayed parameters.

2. For every parameter, its *L-J graph* presents maximum 31 points.

3. For every parameter, the upper dash line of its ***L-J graph*** represents the upper limit of the expected range of the analysis result. The corresponding value (10.5 in case of the WBC in Figure 4-9) equals ***Mean*** + ***Range*** and is displayed on the left of the line.

4. For every parameter, the lower dash line of its L-J graph represents the lower limit of the expected range of the analysis result. The corresponding value (9.5 in case of the WBC in Figure 4-9) equals ***Mean*** - ***Range*** is displayed on the left of the line.

5. For every parameter, its expected result (10.0 in case of the WBC in Figure 4-9) is displayed between the values of the upper dash line and of the lower dash line.

6. For every parameter, the three numbers on the right of its L-J graph represents:

Mean – the mean value of the saved results, as the equation below defines,

$$Mean = \frac{\sum_{i=1}^{n} X_i}{n}$$

where ***n*** represents how many times the QC program has been run and X_i is the result acquired from every QC analysis.

Diff – standard deviation of the saved analysis results, as the equation below defines,

$$Diff = \sqrt{\frac{\sum \left(X_i - Mean \right)^2}{n-1}}$$

where ***n*** represents how many times the QC program has been run and X_i is the result acquired from every QC analysis and ***Mean*** is the mean value derived from the first equation.

CV% - Coefficient of Variation, as the equation below defines

$$CV\% = \frac{Diff}{Mean} \times 100\%$$

where ***Mean*** is the mean value derived from the first equation and ***Diff*** is the standard deviation derived from the second equation.

7. Every point in the graph is interpreted as follows:

The darkened square ■ that falls between the upper dash line and the lower dash line is within the control range. Otherwise, it is not. The blank square □ represents the QC analysis either ran into errors or is out of the display range.

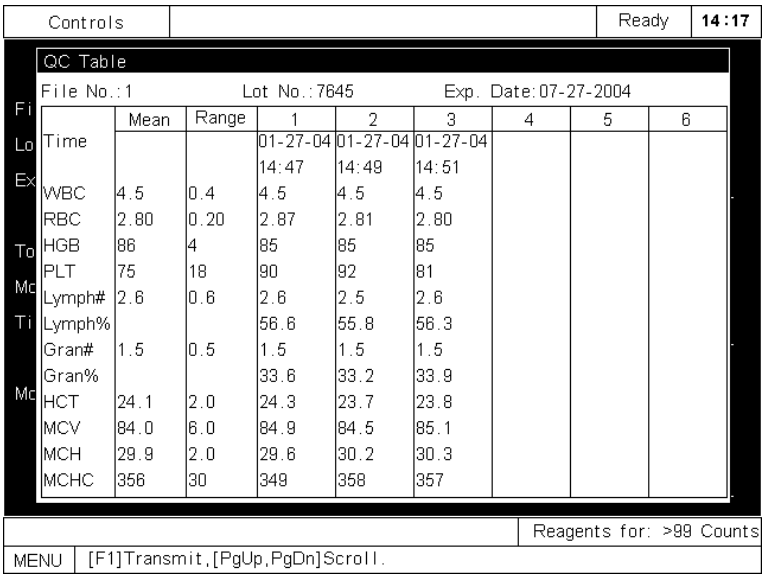
8. Other operations:

To print out the currently displayed ***L-J graph***, press [PRINT]. To acquire help information, press [HELP]. To return to the ***controls*** screen, press [MENU].

4.1.5.2 QC Table

At the ***Controls*** screen, press [F5] to enter the ***QC Table*** screen, as Figure 4-12 shows, where

every screen displays the results of 6 QC analysiss. You can press [PgUp] or [PgDn] to switch to the previous or next screen to view the results of other saved QC analysis.



	Mean	Range	1	2	3	4	5	6
Time			01-27-04 14:47	01-27-04 14:49	01-27-04 14:51			
WBC	4.5	0.4	4.5	4.5	4.5			
RBC	2.80	0.20	2.87	2.81	2.80			
HGB	86	4	85	85	85			
PLT	75	18	90	92	81			
Lymph#	2.6	0.6	2.6	2.5	2.6			
Lymph%			56.6	55.8	56.3			
Gran#	1.5	0.5	1.5	1.5	1.5			
Gran%			33.6	33.2	33.9			
HCT	24.1	2.0	24.3	23.7	23.8			
MCV	84.0	6.0	84.9	84.5	85.1			
MCH	29.9	2.0	29.6	30.2	30.3			
MCHC	356	30	349	358	357			

Figure 4-12 QC Table Screen

If you want to delete all the saved results, press [DEL] and confirm the deletion.

If you want to transmit the saved QC results to an external computer, follow the steps given below:

A. Press [F1] to enter the dialog box shown in Figure 4-13.
B. Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to confirm the transmission. Or
C. Press [←] or [→] to move the cursor to ***No*** and press [ENTER] to cancel the transmission.

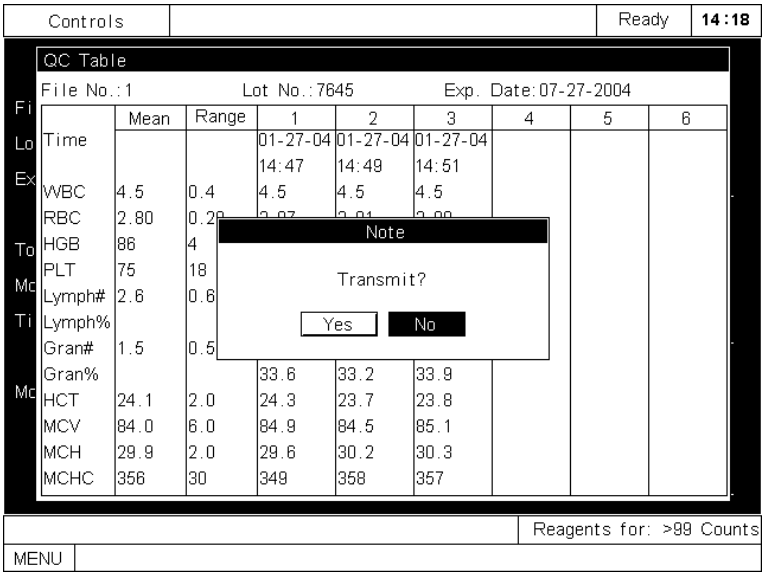


Figure 4-13 Transmission dialog box

4.2 X-B Analysis

The X-B represents the moving average of hematology values calculated using an algorithm developed by Dr. Brian Bull. The X-B analysis uses the Bull algorithm to monitor the performance of the analyzer by tracking the average red cell indices in the patient population analyzed on it. The X-B analysis demands random samples and therefore, the samples categorized by diseases are not suitable for its use.

This X-B analysis program analyzes the three above-mentioned parameters on the patient samples run through this analyzer in batches of 20.

4.2.1 Entering the X- B Analysis Screen

Press [MENU] to enter the system menu. Press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to the ***Quality Control*** → ***X-B Analysis***, as Figure 4-14 shows.

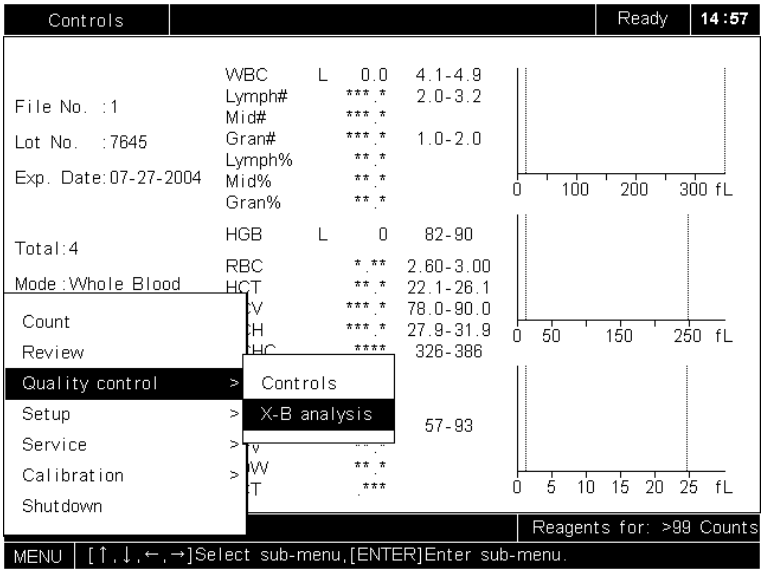


Figure 4-14 Entering ***X-B Table*** Screen

Press [ENTER] to enter the ***X-B Table*** screen, as Figure 4-15 shows.

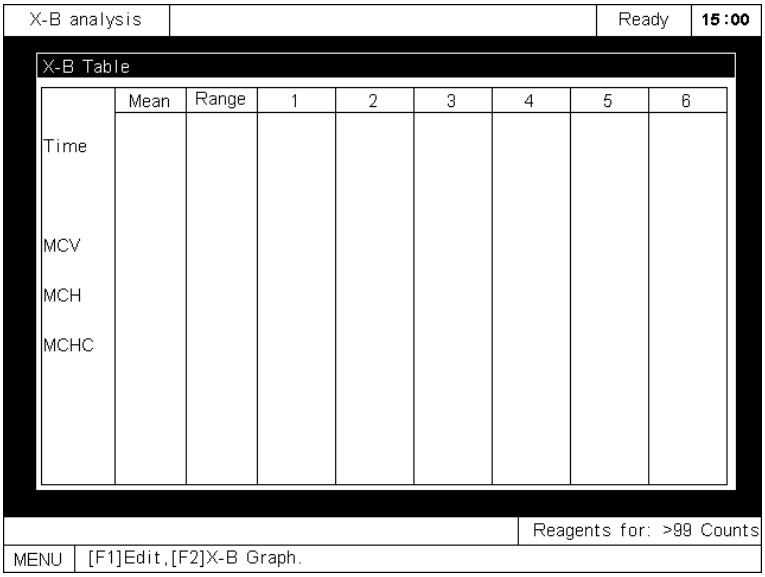


Figure 4-15 ***X-B Table*** Screen

At the screen, if you want to acquire help information, press [HELP]. If you want to print out the existing X-B results by an external printer, press [PRINT]. You cannot print the X-B results by the built-in recorder. If you want to delete the displayed X-B results, press [DEL] and confirm the deletion.

4.2.2 **Editing X-B Settings**

At the ***X-B Table*** screen, press [F1] to enter the ***X-B Edit*** screen as shown in Figure 4-16

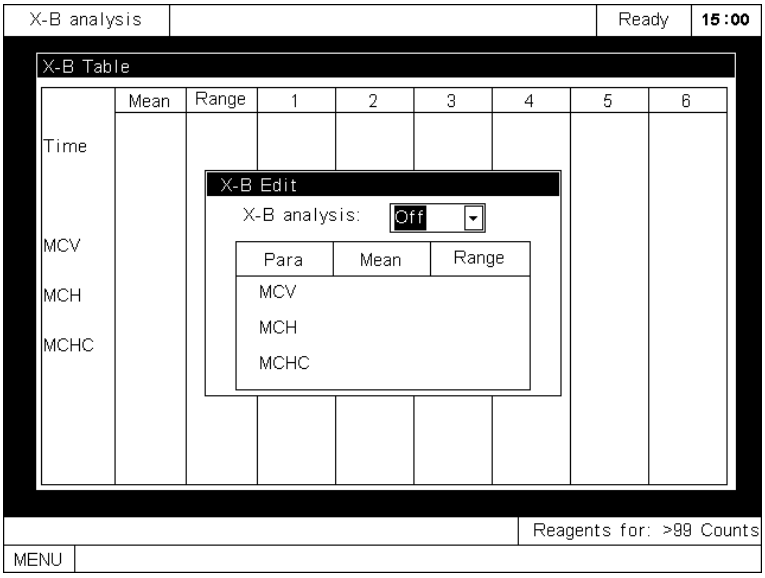


Figure 4-16 X-B edit screen

1. Enabling/disabling ***X-B analysis***

   A. Press [↑] or [↓] to move the cursor to the combo box right of ***X-B analysis***.

   B. Press [ENTER] to display the pull-down menu, as Figure 4-17 shows.

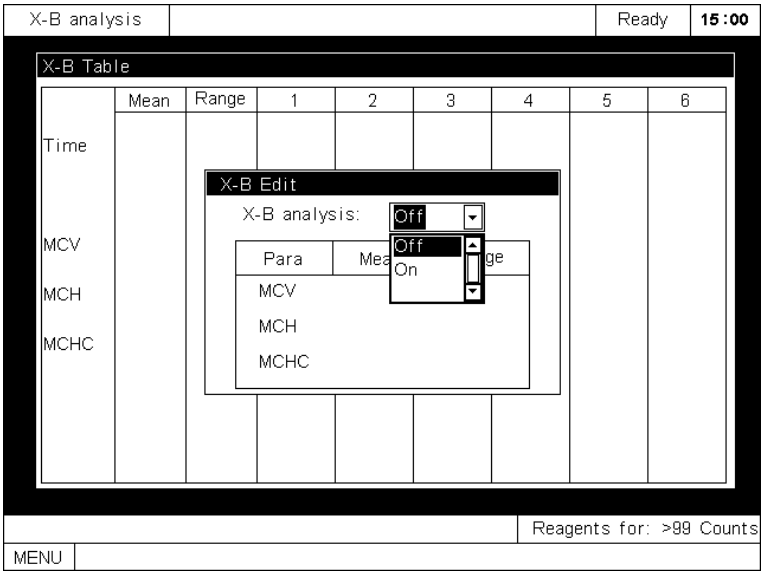


Figure 4-17 Eabling X-B analysis

   C. Press [↑] or [↓] to move the cursor to the ***On/Off*** and press [ENTER] to enable or disable the ***X-B analysis***.

2. Entering expected results and ranges

To include a parameter in the upcoming X-B analysis, you must assign the mean and range to that parameter. The mean is obtained by taking the average of the analysis results of a certain amount of patient samples (best greater than 1,000) and vary depending on the regions. The recommended range is between 5% and 10% of the mean. Follow the steps given below to enter the mean and range to the ***Mean*** and ***Range*** columns respectively.

   A. Press [↑] or [↓] to move the cursor to ***Mean*** (or ***Range***) of the parameter.

   B. Press [←] or [→] to move the cursor to the desired position within the field.

   C. Press [PgUp] or [PgDn] (or the numeric keys on the external keyboard) to enter a digit at the position where the cursor is located. Note that this analyzer adopts an internal fixed decimal point. Therefore, you can just enter the digits without paying attention to the decimal point.

   D. To modify a digit at a certain position, just move the cursor to that position and re-enter the desired digit.

   E. When you are done entering the means (or ranges), press [MENU] to exit the ***X-B Edit***

screen. Note that if the entered expected result is less than or equal to the corresponding range, the system, when exiting the ***X-B Edit*** screen, will warn the user that the entered values are invalid and automatically clears the ***Mean*** and ***Range*** columns.

3. Exiting

When you are done editing the **X-B settings**, follow the steps given below to return to the ***X-B Table*** screen.

A. Press [MENU] and a dialog box will pop up to remind the user to save the changes, as Figure 4-18 shows. You may

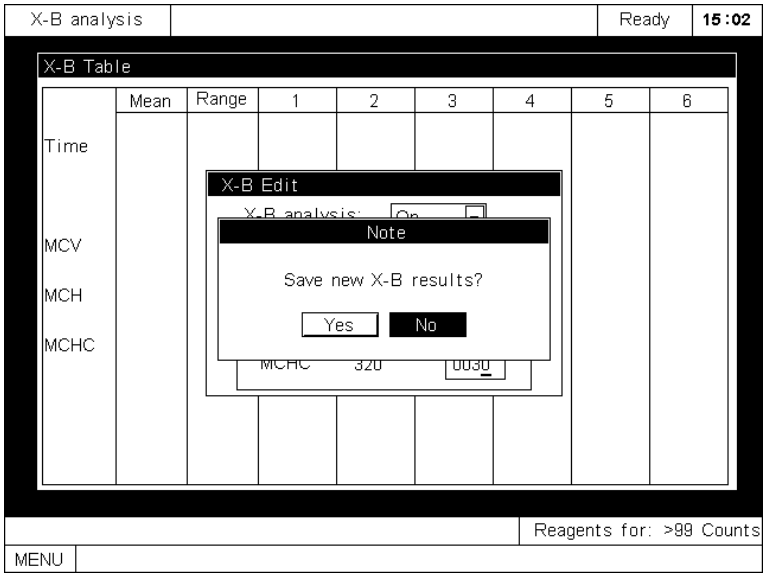


Figure 4-18 Dialog Box to Confirm the Changes

B. Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to save the changes and exit. Or

C. Press [←] or [→] to move the cursor to ***No*** and press [ENTER] to exit without saving the changes.

4. Other operations

A. You must empty the ***X-B table*** before editing the **X-B settings**.

B. If you neither entered new settings nor changed the old settings, you may press [MENU] to directly return to the ***X-B Analysis*** screen without seeing the dialog box shown in Figure 4-18. If you want to print out the saved X-B settings, press [PRINT]. Note newly entered or changed settings will not be printed out until they are saved.

4.2.3 Running X-B Analysis

After you have enabled the ***X-B analysis*** and assigned valid means and ranges to the three parameters, the system will automatically run the X-B analysis every 20 patient samples, of which the MCV, MCH and MCHC results are within the set ranges.

4.2.4 Reviewing X-B Results

This analyzer automatically saves the results of the X-B analyses. You can review the saved results in two modes - X-B graph and X-B Table.

4.2.4.1 X-B Table

Follow the steps introduced in section 4.2.1 Entering the X- B Analysis Screen.

4.2.4.2 **X-B Graph**

At the ***X-B Table*** screen, press [F2] to enter the ***X-B Graph*** screen, as Figure 4-19 shows. For every parameter, the ***X-B graph*** presents 500 points, 30 for every screen. You can press [PgUp] or [PgDn] to view the previous or next screen. At every screen, you can press [←] or [→] to view the results of every point (displayed in the box below the parameter name)one by one.

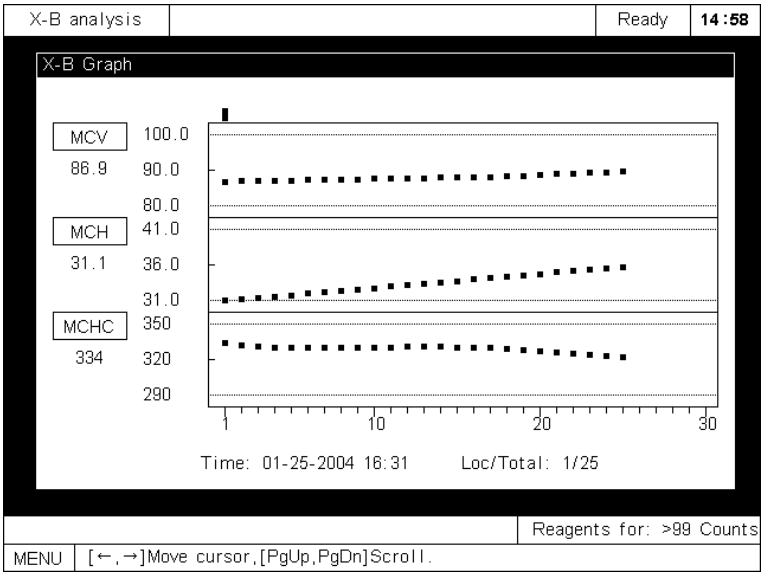


Figure 4-19 ***X-B graph*** Screen

X-B Graph:

1. The x-coordinate represents how many times the QC program has been run. The y-coordinate represents the analysis results of the displayed parameters.
2. For every parameter, the upper dash line of its X-B graph represents the upper limit of the expected range of the analysis result. The corresponding value (100 in case of the MCV in Figure 4-19) equals Mean + Range and is displayed on the left of the line.

3. For every parameter, the lower dash line of its X-B graph represents the lower limit of the expected range of the analysis result. The corresponding value (80 in case of the MCV in Figure 4-19) equals Mean - Range is displayed on the left of the line.

4. For every parameter, its mean (90 in case of the MCV in Figure 4-19) is displayed between the values of the upper dash line and of the lower dash line.

5. The time at which the sample was analyzed is displayed in the ***Time*** field.

6. The current cursor position and the number of all the saved points are displayed in the ***Loc./Totall*** field.

7. To print out the displayed X-B analysis results, press [PRINT]. To acquire help information, press [HELP]. To exit back to the ***X-B table*** screen, press [MENU].

Chapter 5 **Calibration**

5.1 **Introduction**

The BC-2800 Auto Hematology Analyzer was calibrated before leaving the factory. However, errors may still be introduced to the system during transportation and applications. Therefore, you must calibrate this analyzer before using it for the first time and after every repair. You may also calibrate this analyzer when you find system errors during the QC analysis. You can calibrate this analyzer one of the three ways - manually, with calibrators and with fresh blood.

5.1.1 Purpose of Calibration

The purpose of calibrating the BC-2800 is to ensure the accuracy of the analysis results. Be sure to follow the instructions given in the Chapter to calibrate this analyzer as needed.

Note

The analyzer can provide valid data only after being calibrated

5.1.2 Quality of Calibration

The calibration quality depends on the calibration materials and reagents. You should use the calibrator and reagents recommended by Mindray. You should properly store the calibrator and reagents. Do not use expired calibrator or reagents. Before calibration, be sure to warm the calibrator to room temperature and well mix it.

5.2 Preparing for Calibration

The BC-2800 can be calibrated by two calibrators – the commercial calibrator and fresh blood. When calibrated with the commercial calibrator or fresh blood, the analyzer will automatically calculate the calibration factors and fill them to the ***Manual*** screen. The BC-2800 provides two sets of calibration factors for the whole blood mode and prediluted mode respectively.

Do the following four checks before calibration. If any of four checks fails, do not proceed to the calibration.

1. Check the analyzer and reagents. Make sure the reagents are sufficient for the calibration and all the needed materials are prepared.

2. Check the background as instructed by Section **3.7 Background check** and make sure the result meets the requirements listed in **table** 3-4.

3. At the Count screen, analyze the control material for at least 10 times to ensure the reproducibility is within the range specified in Table 5-1.

Table 5-1 Reproducibility

Parameter	Condition	CV(%)
WBC($\times10^9$/L)	4.0 - 7.5	≤ 3.0
	7.6 - 15.0	≤ 2.0
RBC ($\times10^{12}$/L)	3.00 - 4.50	≤ 2.0
	4.51 - 6.50	≤ 1.5
HGB (g/L)	110 – 180	≤ 1.5
MCV (fL)	70.0 – 100.0	≤ 1.0
PLT ($\times10^9$/L)	100 – 200	≤ 5.0
	201 – 500	≤ 4.0

4. Mindray recommends a record table, which may include date, calibrator information (name, lot number and mean) and background check results, be prepared to keep the calibration results.

When are done with the preparation, you may choose one or several of the following parameters for calibration：WBC, RBC, HGB, MCV and PLT.

The calibration should be conducted by the administrators (see **Section 7.1.1**) rather than the common users. The calibration range of the calibration factors of the BC-2800 is 75% -125%.

5.3 **Manual Calibration**

5.3.1 Calibration

1. Press [MENU] to enter the system menu. Press the appropriate arrow keys to move the cursor to ***Count*** screen, as Figure 5-1 shows.

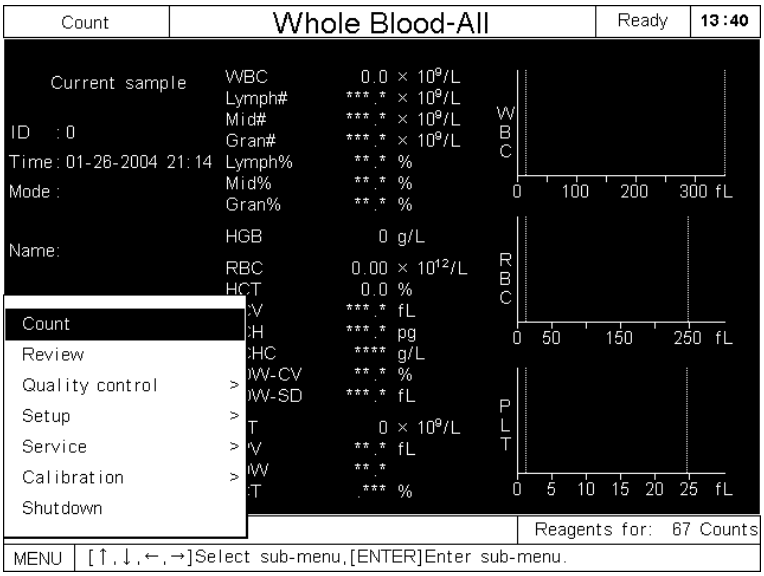


Figure 5-1 Entering count screen

2. Press [ENTER] to enter the Count screen, as Figure 5-2 shows.

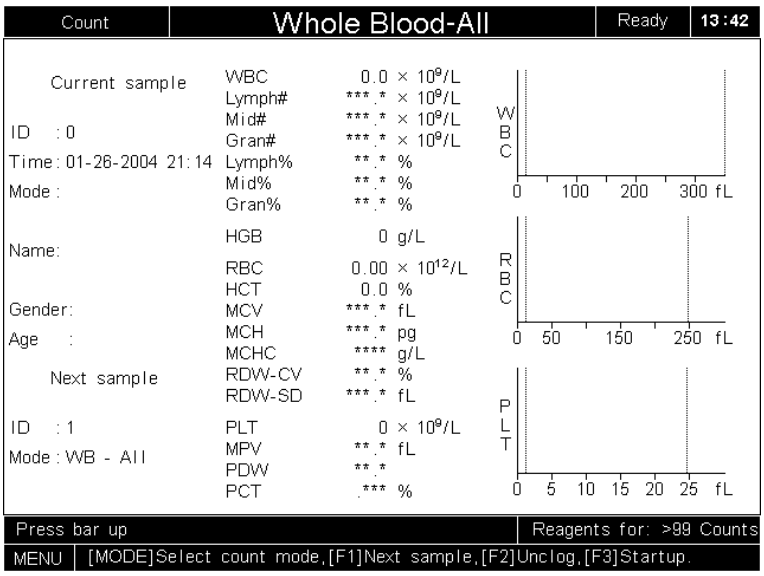


Figure 5-2 Count screen

3. Prepare the calibration material as instructed by **Section 3.5** and then follow **Section 3.6**, to analyze the prepared calibration materials in the desired mode for several times (at least 5

times). The reproducibility of the WBC, RBC, HGB, MCV and PLT should meet the requirements specified in Table 5-1.

5.3.2 Entering the Manual Calibration Screen

1. Press [MENU] to enter the system menu. Press the appropriate arrow keys to move the cursor to ***Calibration*** → ***Manual*****,** as Figure 5-3 shows.

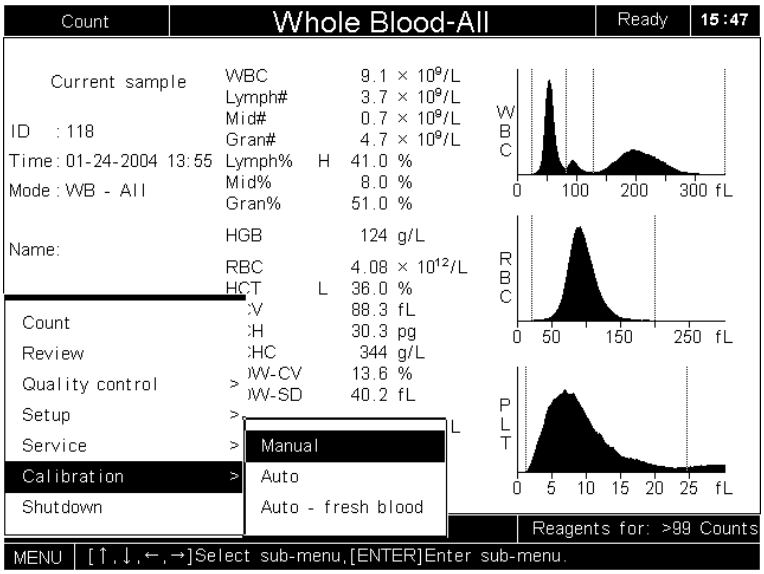


Figure 5-3 Entering Manual from the system menu

2. Press [ENTER] to enter the ***Manual*** screen, as Figure 5-4 shows.

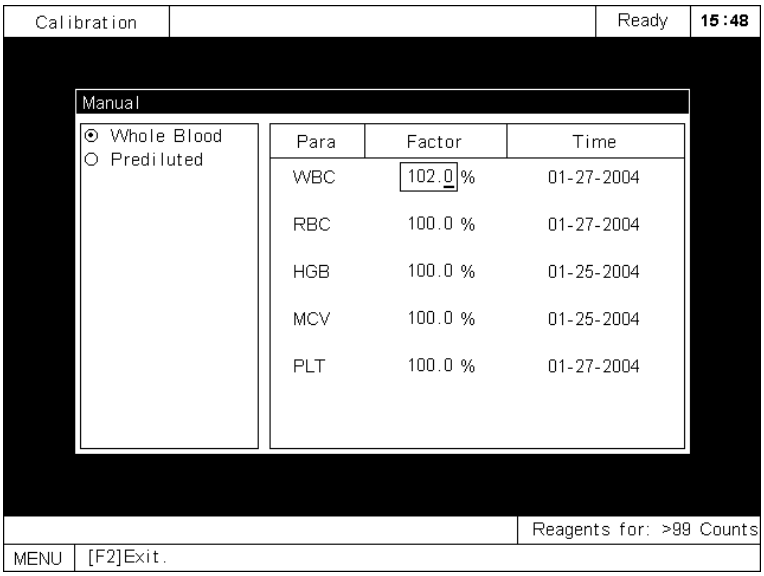


Figure 5-4 Manual screen

The left of the ***Manual*** screen displays the available calibration modes – whole blood and prediluted. The right of the ***Manual*** screen displays the calibration factors of WBC, RBC,

HGB, MCV and PLT and the time the factors are saved.

5.3.3 Entering new calibration factors

1. At the ***Manual*** screen, press [F1] to select the calibration mode as you need.
2. Calculate the new calibration factors per the following formula.

$$new\ \ factor = \frac{old\ \ factor \times reference\ value}{average\ of\ \ test\ value}$$

Example：
Assuming for a certain calibrator, the expected WBC value(namely the reference value mentioned in the formula above) is 8.4 and the current whole blood calibration factor is 98.9%, analyze this calibration material in the whole blood mode for five times （n=5）and the results are 8.1, 8.0，8.1, 8.1, and 8.3.

$$Mean = \frac{\sum_{i=1}^{n} x_i}{n} = 8.12$$

$$Diff = \sqrt{\frac{\sum \left(X_i - Mean \right)^2}{n-1}} = \sqrt{0.012} \approx 0.11$$

$$CV\ \% = \frac{Diff}{Mean} \times 100\ \% \approx 1.3\% < 2\%$$

Since the calculated CV is less than 2%, the mean value, 8.12, is valid and the new calibration factor can be calculated as follows:

$$newfactor = \frac{98.9\% \times 8.4}{8.12} = 102\%$$

3. Press [F2] to enable the edit boxes right of the 5 parameters, as Figure5-5 shows.

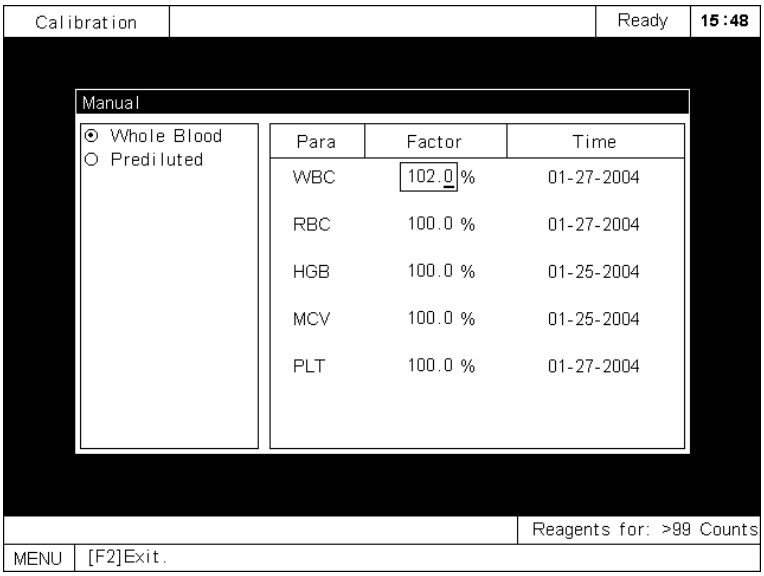


Figure5-5 Editing calibration factors

Detailed operation:

Press [↑][↓] to switch among the factors; press [←][→] on the keypad to move the cursor within the edit box; press [PgUp] [PgDn] to change the digits; Use the numeric keys on a keyboard to enter the desired number directly.

4. Exiting

When press [F2] to quit editing the factors, the analyzer will judge whether the factors have been changed. If nothing was changed, it will directly go back to the Manual screen. If there are some changes and the entered number is out of the calibration range, a dialog box will pop up to remind you're the entered number is invalid, as Figure5-6.

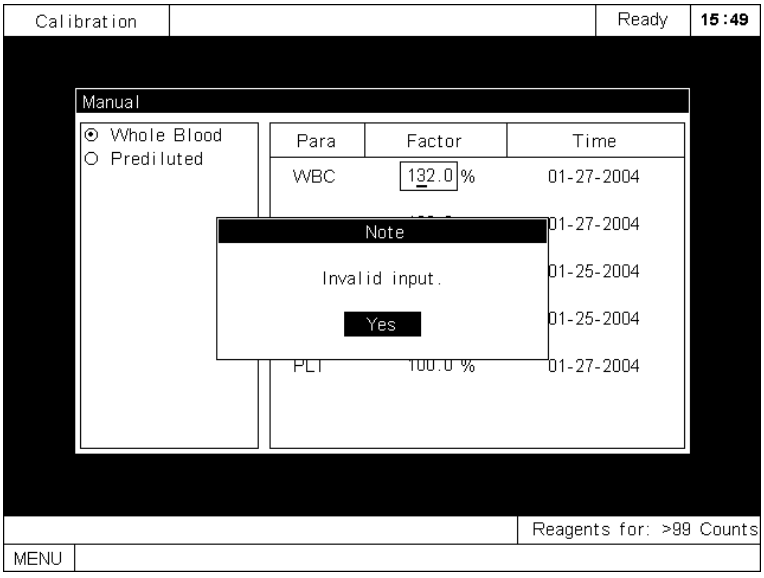


Figure5-6 The dialog box to remind you of invalid values

Press [ENTER] and re-enter the factors. If the changed factors are all within the calibration range, a dialog box will pop up to remind you to save the new factors, as Figure 5-7 shows.

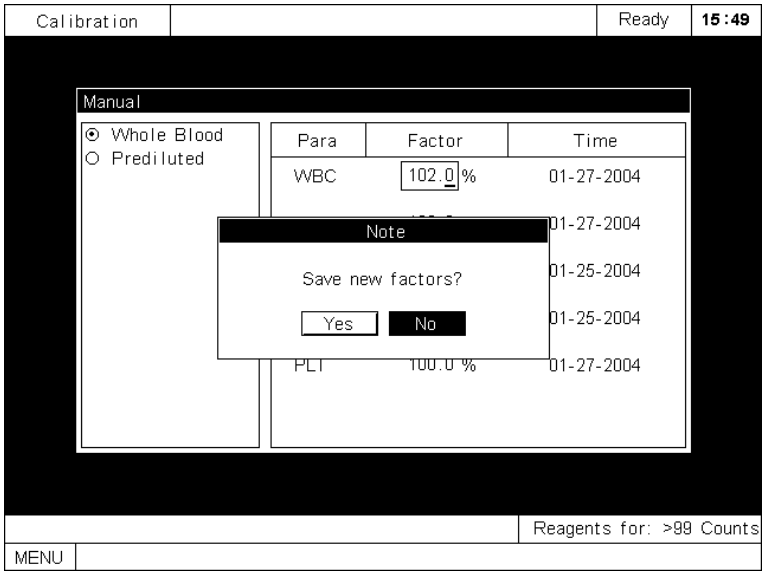


Figure 5-7 The dialog box to remind you to save the changes

To save the new factors, press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to return to the ***Manual calibration*** screen with new factors.

5. Other operations

At the ***Manual*** screen, if you want to print out the calibration factors, press [PRINT]; if you want to acquire help information, press [HELP]. If you want to return to the system menu, press [MENU].

5.3.4 Testing New Factors

After the new factors are saved, go to the Count screen to analyze the calibrator or control material for at least five continuous times. Take the average of the analysis results and compare it to the expected value and make sure the average is within the expected range specified by the data sheet of the calibrator or control. If not, contact Mindray customer service department.

5.4 Calibration Using Calibrators

5.4.1 Entering the Auto Calibration Screen

Press [MENU] to enter the system menu. Press the appropriate arrow keys to move the cursor to ***Calibration*** →***Auto***, as Figure 5-8 shows.

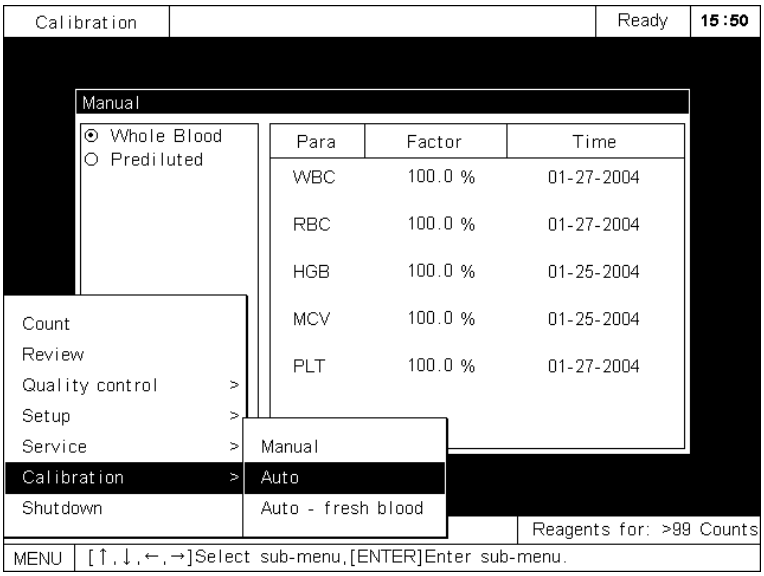


Figure 5-8 Entering auto-calibrator screen from system menu

Press [ENTER] to enter the ***Auto calibration*** screen, as Figure 5-9 shows.

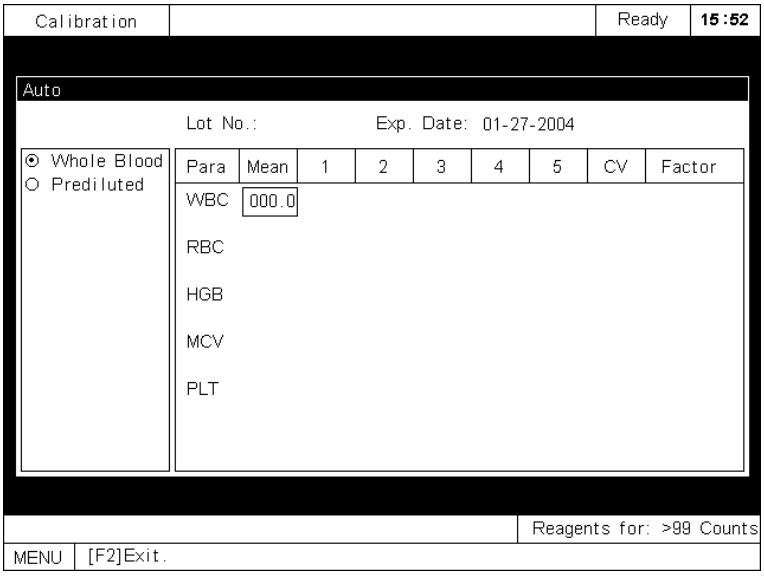


Figure 5-9 Auto-calibrator screen

5.4.2 Editing Calibration Settings

1. At the ***Auto calibration screen***, press [F1] to select the desired calibration mode.
2. Press [F2] to enable the edit boxes, as Figure5-10 shows.

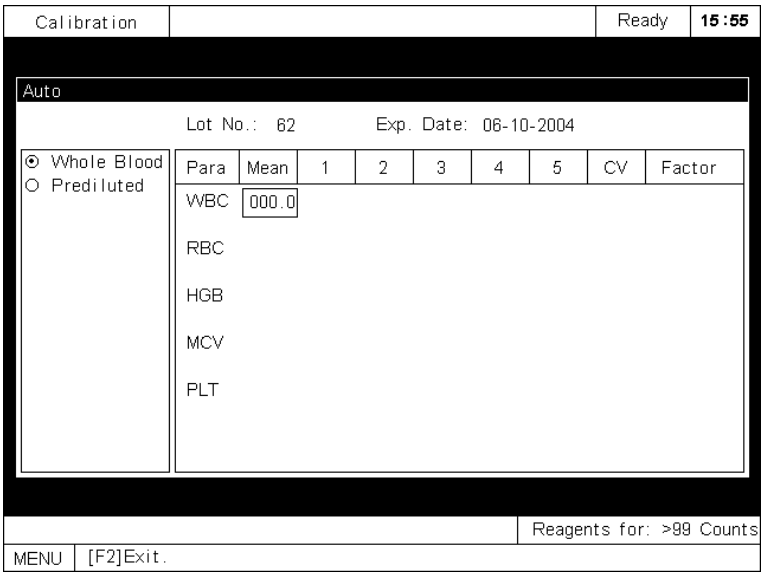


Figure5-10 Editing reference values for the parameters to be calibrated

3. Follow the instruction below to edit the values (refer to the instruction manual of the calibrator for such information as lot number, expiration date and reference values).

- Entering lot number

Press [↑] or [↓] to move the cursor to the edit box right of ***Lot No***.; Press [←] or [→] to move the cursor to the desired position within the box; Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter a digit at the position where the cursor is located. To modify a digit at a certain position, just move the cursor to that position and re-enter the desired digit.

- Entering expiration date

Press [↑] or [↓] to move the cursor to the edit box right of ***Exp. Date***; press [PgUp] or [PgDn] to enter the digits for the expiration date in the MM-DD-YYYY format.

- Entering reference

To include a parameter into the upcoming calibration, you must first set a reference value for it. Move the cursor to corresponding edit box in the ***Mean*** column and enter the expected value to it (similar to enter the lot number).

- Press [F2] to quit editing.

5.4.3 Calibration

1. When you are done editing the calibration settings, go to the Auto calibration screen to analyzer the prepared calibrator.

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Warning

The probe is sharp and may contain biohazard materials, including controls and calibrators. Avoid any unnecessary contact with the probe and probe area.

2. Press the [START] key to start the analysis and the progress bar is displayed.
3. When the analysis ends：

- If the obtained result is valid, a dialog box will pop up to ask you confirm the calibration, as Figure 5-11 shows.

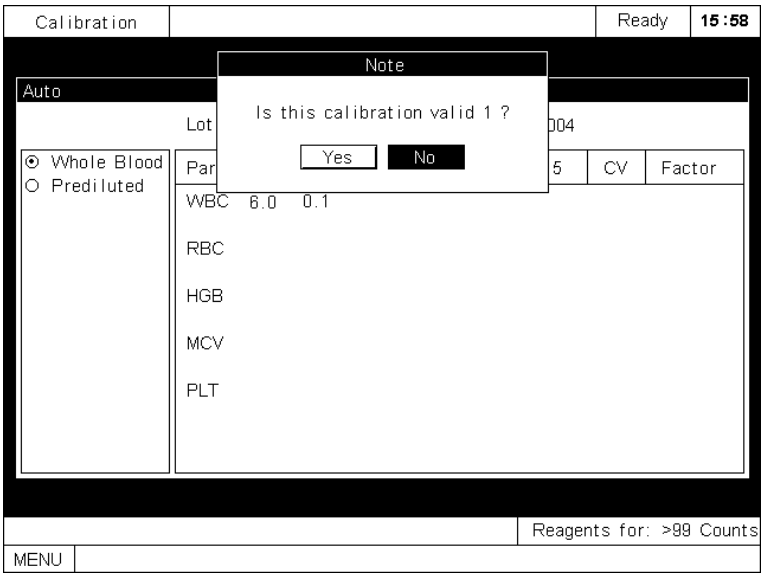


Figure 5-11 The dialog box to confirm the calibration is valid

To save the result, press [←][→] to move the cursor to ***Yes*** and press [ENTER] and the result will be displayed on the screen; otherwise, move the cursor to ***No*** and press [ENTER] to discard the result.

- If the obtained result is invalid (***), a dialog will pop up to warn you, as Figure 5-12 shows. Press [ENTER] to close the dialog box and discard the result.

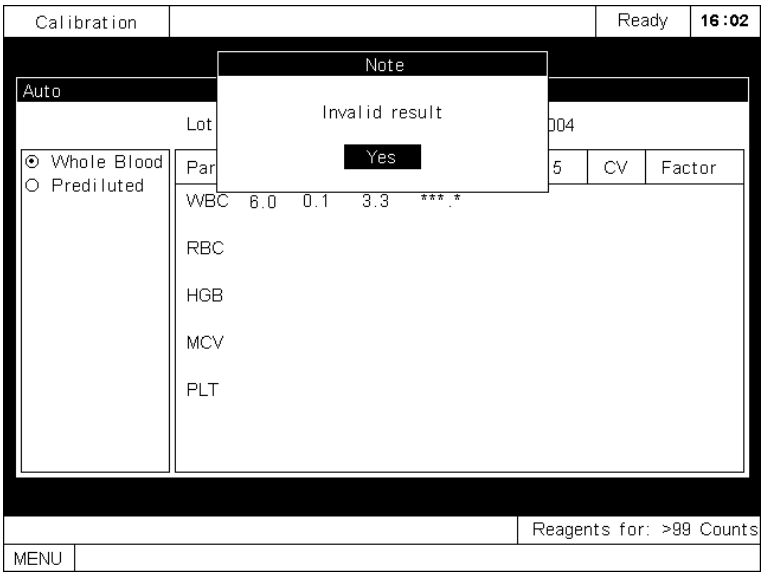


Figure 5-12 The warning dialog box

4. After you have saved three calibration results, this analyzer will automatically display the CV and calibration factors. You can save maximum five calibration results, as Figure5-13 shows. Note that the CVs should be within the ranges specified in Table 5-1.

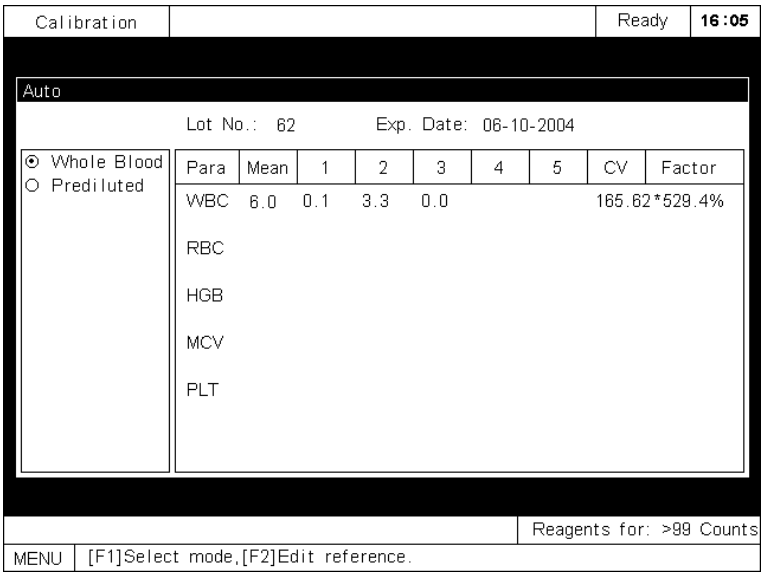


Figure5-13 Results of auto calibration

Any factor that falls out of the calibration range will be flagged by a * at the upper right corner. When it happens, you should try to find out the reason. If the problem is beyond your ability, contact Mindray customer service department.

5. Exiting:

To save the new factors, press [←][→] to move the cursor to ***Yes*** and press [ENTER] to save the factors to the ***Manual calibration*** screen in another calibration mode. Otherwise, move the cursor to No and press [ENTER] to switch to the ***Manual calibration*** screen in another calibration mode without saving the new factors.

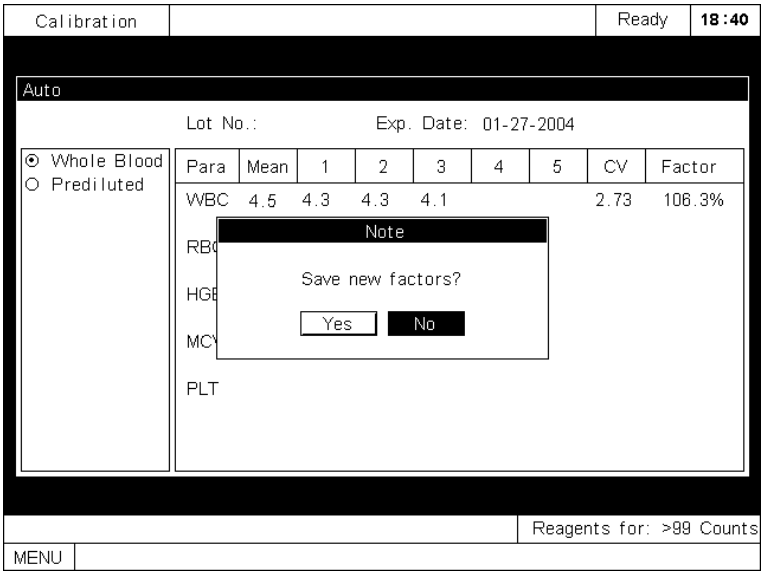


Figure5-14 Saving changes

- Press [MENU] and a dialog box will pop up to ask you to save the new factors, as Figure5-14 shows. To save the new factors, press [←][→] to move the cursor to ***Yes*** and press [ENTER] to save the factors to the system. Otherwise, move the cursor to ***No*** and press [ENTER] to switch to the system menu without saving the new factors.

6. Other operations：

- If calibration data (calibration results, CV or new factors) exist, when you press [F2], a dialog box will pop up to warn you, as Figure5-15 shows. Press [ENTER] to return to the ***Auto calibration*** screen.

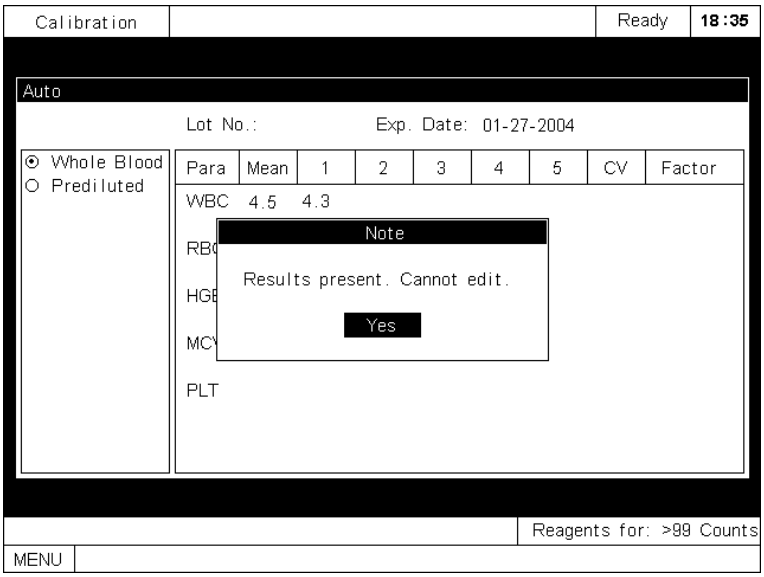


Figure5-15 Reject edit dialog box

- If the valid results are less than three (the CV and new factors are not available yet)：

If you press [F1], a dialog box will pop up to warn you about the data loss, as Figure5-16 shows.

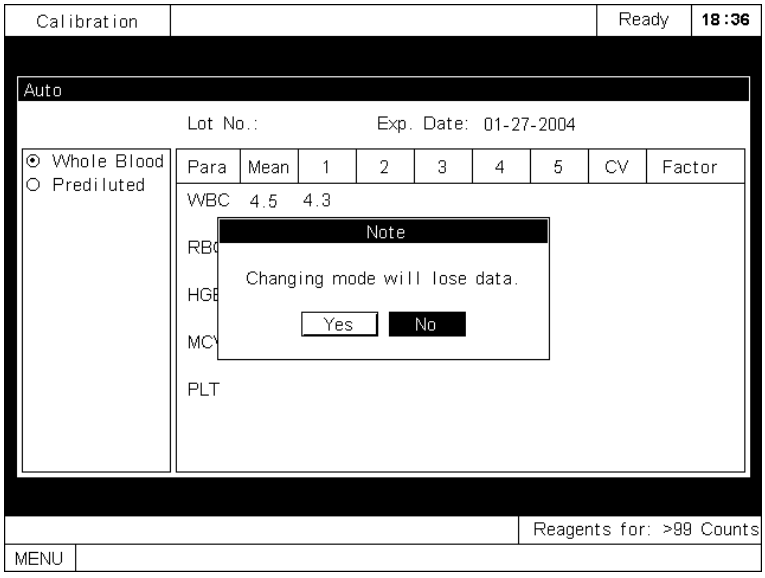


Figure5-16 Warning dialog box

To switch the modes, press [←] or [→] to move the cursor to ***Yes*** and press[ENTER] and the saved data will be cleared; otherwise, move the cursor to ***No*** and press [ENTER] to return t the

Auto calibration screen. If you press [MENU], the system menu will pop up and the saved calibration results will be cleared.

- At the ***Auto calibration*** screen, when the CV and new factors are available, you can press [PRINT] to print out the displayed information.
- To acquire help information, press [HELP].
- To return to the system menu, press [MENU].

5.4.4 Testing new factors

After the new factors are saved, go to the ***Count*** screen to analyze the calibrator or control material for at least five continuous times. Take the average of the analysis results and compare it to the expected value and make sure the average is within the expected range specified by the data sheet of the calibrator or control. If not, contact Mindray customer service department.

5.5 Calibration Using Fresh Blood

You can prepare 3 ~ 5 fresh blood samples and test them on a reference analyzer for three times and take the averages as the reference values of the samples.

5.5.1 Entering the Auto Fresh Blood Screen

Press menu to enter the system menu. Press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Calibration*** → ***Auto-fresh blood***, as Figure5-17 shows.

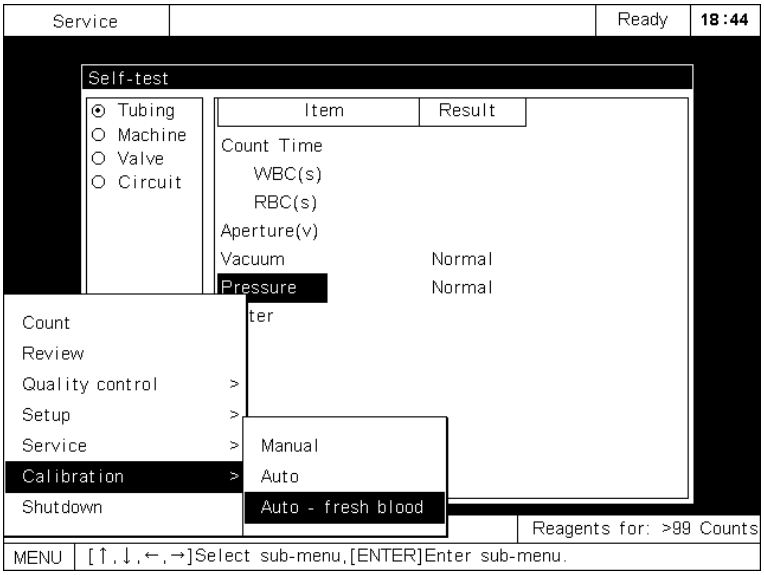


Figure5-17 Entering Auto-fresh blood screen from system menu

Press [ENTER] to enter the system menu, as Figure5-18.

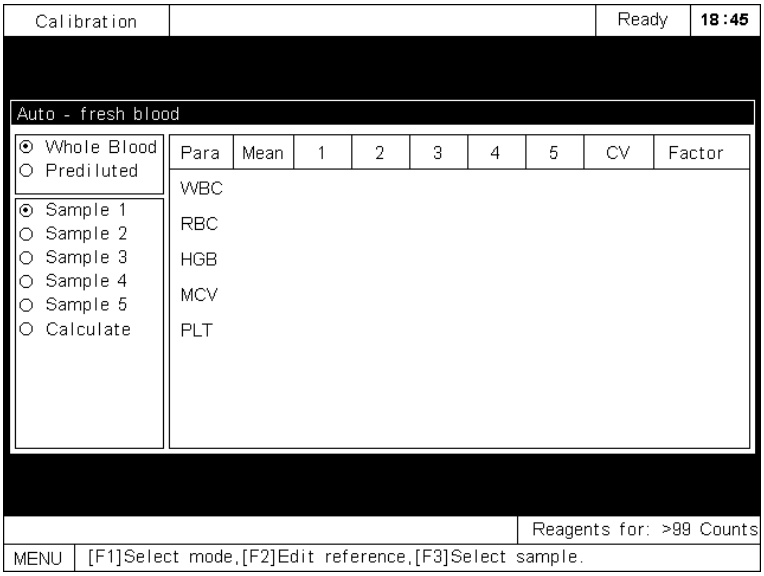


Figure5-18 Auto-fresh blood screen

5.5.2 Editing Reference Values

1. At the ***Auto-fresh blood*** screen, press [F3] to select the whole blood or prediluted mode.

2. When the mode is selected, press [F1] to choose the fresh blood sample whose reference values you want to set.

3. Press [F2] to enable the edit boxes in the Mean column, as Figure5-19 shows.

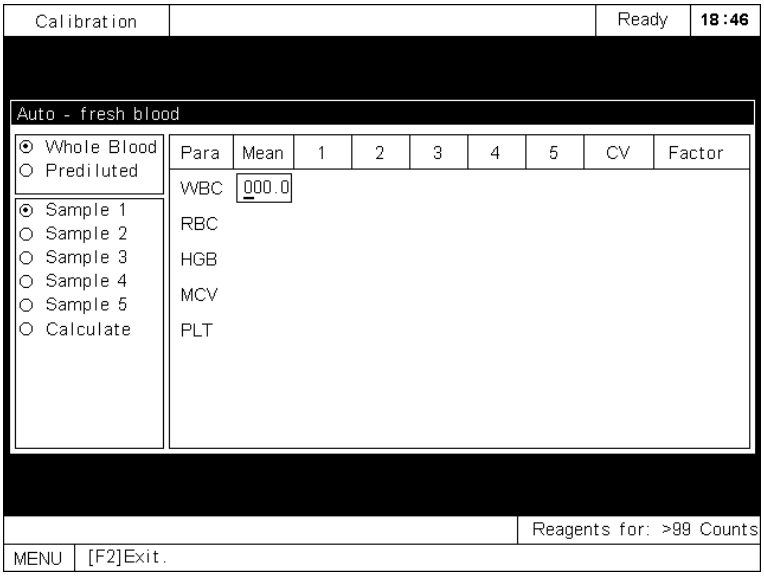


Figure5-19 Editing reference values

4. Press [↑] or [↓] to move the cursor to the edit box right of the parameter whose reference value you want to set; press [←] or [→] to move the cursor within the box; Press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter digits; to modify a digit, move the cursor to the position of the digit and re-enter the desired digit.

5. Press [F2] to quit editing.

5.5.3 Calibration

When you are done editing the calibration settings, go to the ***Auto calibration*** screen to analyzer the prepared fresh blood.

Biohazard

Consider all materials (specimens, reagents, controls, calibrators, or components that contain or have contacted human blood) as being potentially infectious. Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Warning

The probe is sharp and may contain biohazard materials, including controls and calibrators. Avoid any unnecessary contact with the probe and probe area.

1. Press the [START] key to start the analysis and the progress bar is displayed.
2. When the analysis ends：

- If the obtained result is valid, a dialog box will pop up to ask you confirm the calibration, as Figure5-20 shows.

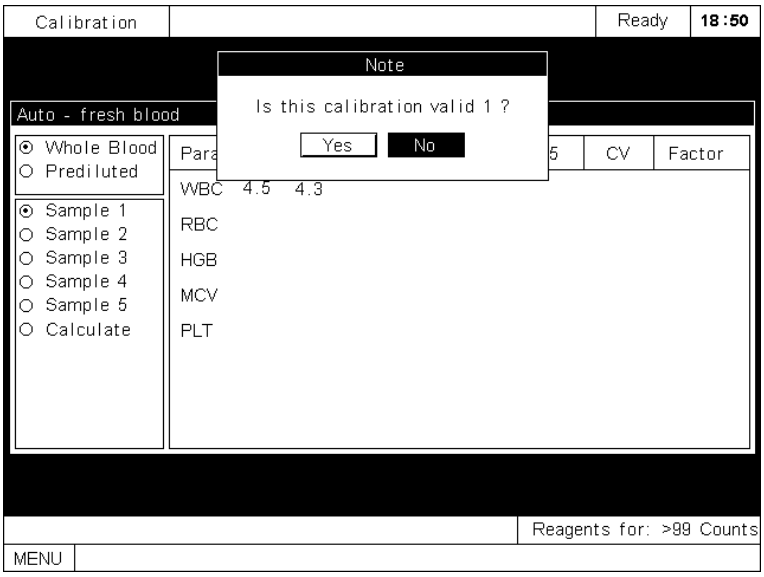


Figure5-20 The dialog box to confirm the calibration is valid

To save the result, press [←][→] to move the cursor to ***Yes*** and press [ENTER] and the result will be displayed on the screen; otherwise, move the cursor to ***No*** and press [ENTER] to discard the result.

- If the obtained result is invalid (***), a dialog will pop up to warn you, as Figure5-21 shows. Press [ENTER] to exit the dialog box and clear the calibration result.

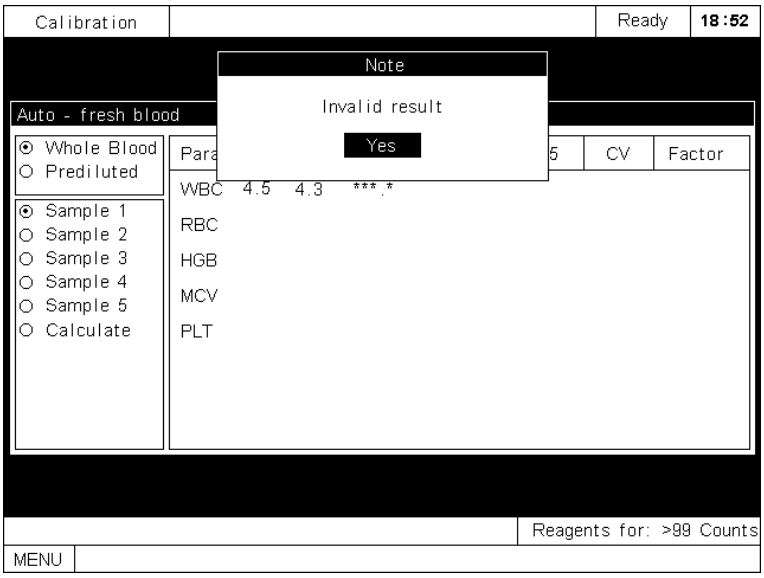


Figure5-21 Invalid result

3. After you have saved three calibration results, this analyzer will automatically display the

CV and calibration factors. You can save maximum five calibration results, as Figure5-22 shows. Note that the CVs should be within the ranges specified in Table 5-1.

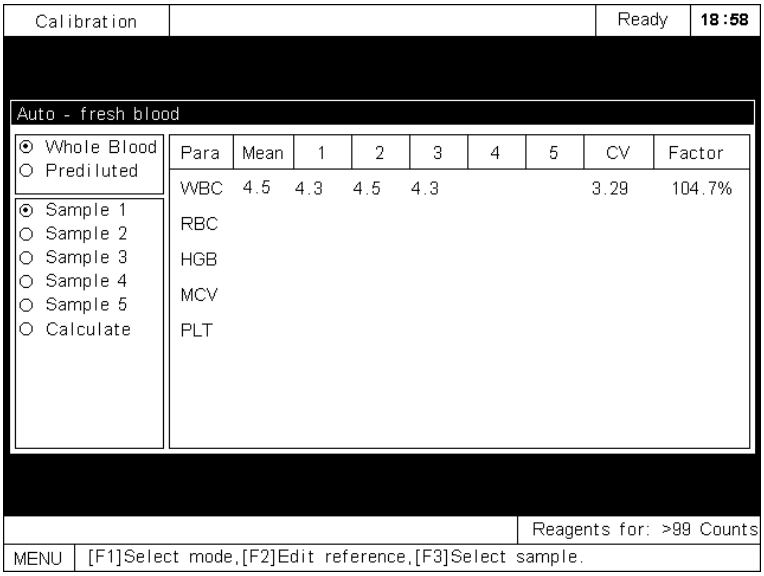


Figure5-22 Calibration using fresh blood

4. Any factor that falls out of the calibration range will be flagged by a * at the upper right corner. When it happens, you should try to find out the reason. If the problem is beyond your ability, contact Mindray customer service department.

5. Press [F1] to select at least another two fresh samples from Sample 2 - Sample 5 and analyze them as instructed above.。

6. When the analyses are done, press [F1] to select ***Calculate*** to enter the ***Calculate*** screen, as Figure5-23 shows. The number 1~5 represents the new factors corresponding to the fresh blood samples 1 - 5.

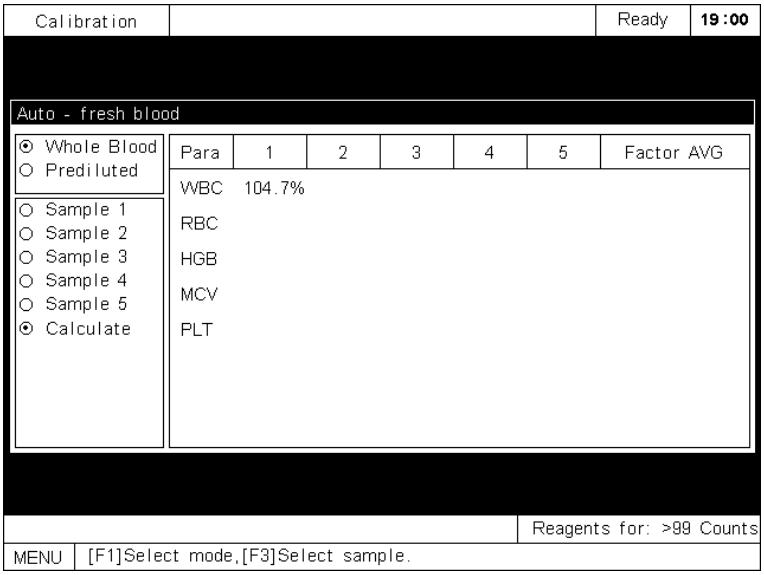


Figure5-23 Calculate

This screen can maximum display the calibration factors for 5 fresh blood samples. Any factor out of the calibration range will be flagged by * at the upper right corner. For any parameter, such as the RBC in，the new calibration factor will be obtained only when at least three calibrations are valid, otherwise the new factor will be blank, as the WBC in Figure5-23.

7. Exiting

- Press [F3] and a dialog box will pop up to ask you to save the new factors, as Figure5-24 shows.

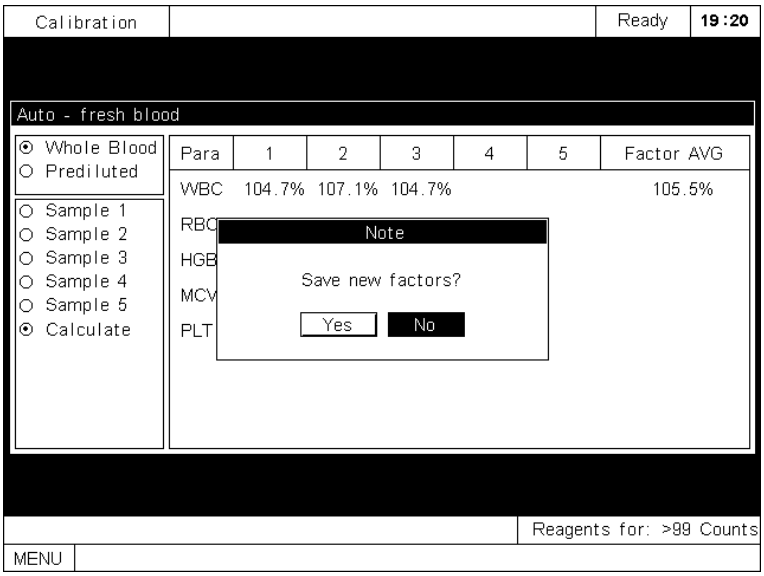


Figure5-24 Saving changes

To save the new factors, press [←][→] to move the cursor to ***Yes*** and press [ENTER] to save the factors(except for those out of the calibration ranges) to the ***Manual calibration*** screen and return to the ***Auto-fresh blood*** screen in another calibration mode. Otherwise, move the cursor to ***No*** and press [ENTER] to switch to the ***Auto-fresh blood*** screen in another calibration mode without saving the new factors.

- Press [MENU] and a dialog box will pop up to ask you to save the new factors, as Figure5-24 shows. To save the new factors, press [←][→] to move the cursor to ***Yes*** and press [ENTER] to save the factors to the Manual calibration screen and return to the system menu. Otherwise, move the cursor to ***No*** and press [ENTER] to switch to the system menu without saving the new factors.

8. Other operations：

- If calibration data (calibration results, CV or new factors) exist, when you press [F1], a dialog box will pop up to warn you, as Figure5-25 shows. Press [ENTER] to return to the ***Auto-fresh blood*** screen.

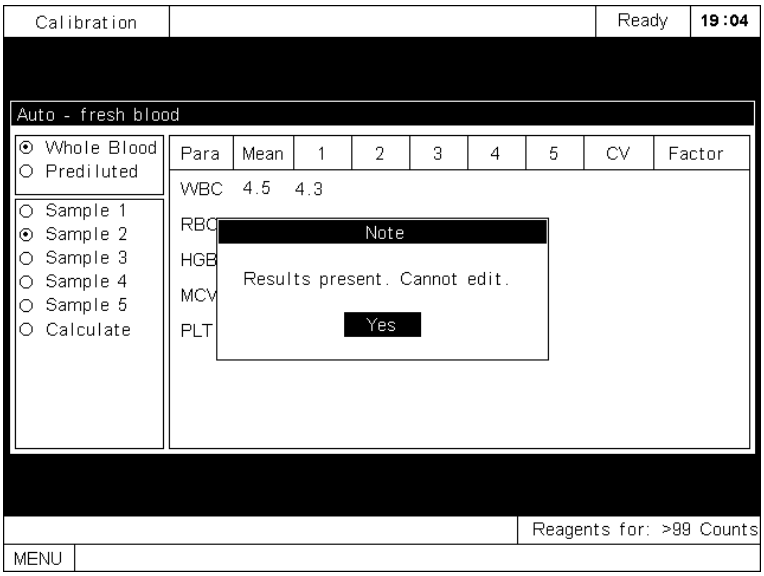


Figure5-25 Reject editing dialog box

- If the valid results are less than three (the CV and new factors are not available yet)：

If you press [F3], a dialog box will pop up to warn you about the data loss, as Figure5-26

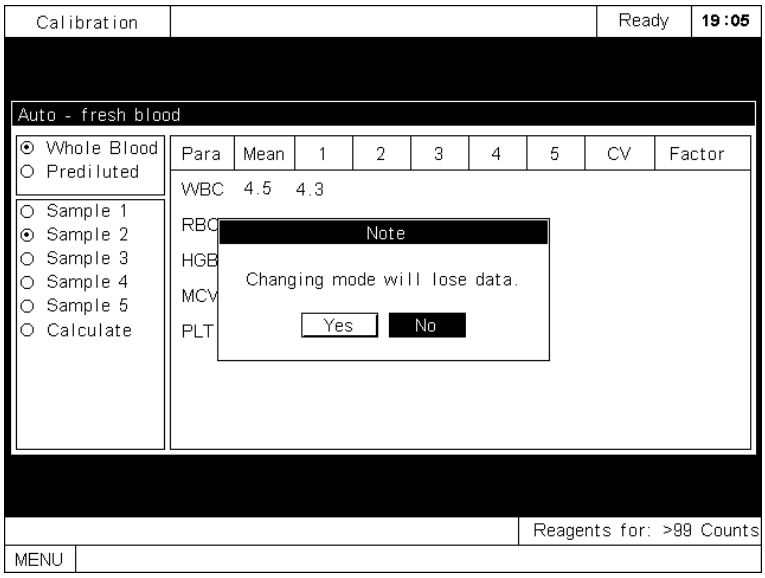


Figure5-26 Warning dialog box

To switch the modes, press [←] or [→] to move the cursor to ***Yes*** and press[ENTER] and the saved data will be cleared; Otherwise, move the cursor to ***No*** and press [ENTER] to exit.

- If you press [MENU], the system menu will pop up. When you enter the ***Auto-fresh blood*** screen again, a dialog box will pop up, as Figure5-27 shows.

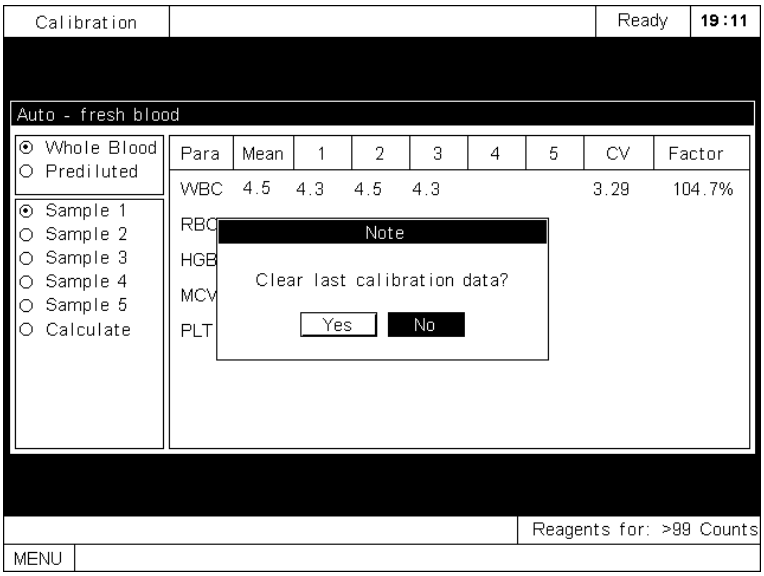


Figure5-27 Warning dialog box

To clear the previous results, press [←] or [→] to move the cursor to ***Yes*** and pres[ENTER] to clear the previous results and enter the ***Auto-fresh blood*** screen; Otherwise, move the cursor to ***No*** and press [ENTER] to save the previous results and enter the ***Auto-fresh blood*** screen.

- At the ***Auto calibration*** screen, when the **CV** and new factors are available, you can press [PRINT] to print out the displayed information. To acquire help information, press [HELP]. To return to the system menu, press [MENU].

5.5.4 Testing New Factors

After you have obtained the new factors, choose one of the following two methods to test the new factors.

Method one：

- Prepare 3 - 5 fresh blood samples and test them on a reference analyzer for at least three times and take the averages and SD as the reference values
- Test these samples on this analyzer for at least three times and take the averages. Compare the averages to the reference values and the difference should be within ±2SD.

Method two：

After the new factors are saved, go to the ***Count*** screen to analyze the calibrator or control material for at least five continuous times. Take the average of the analysis results and compare it to the expected value and make sure the average is within the expected range specified by the data sheet of the calibrator or control. If not, contact Mindray customer service department.

Chapter 6 **Sample Review**

This analyzer automatically saves the analysis results. You can review the saved results in two modes – histogram and table.

6.1 **Histogram Mode**

Press [MENU] to enter the system menu. Press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to Review, as Figure 6-1 shows.

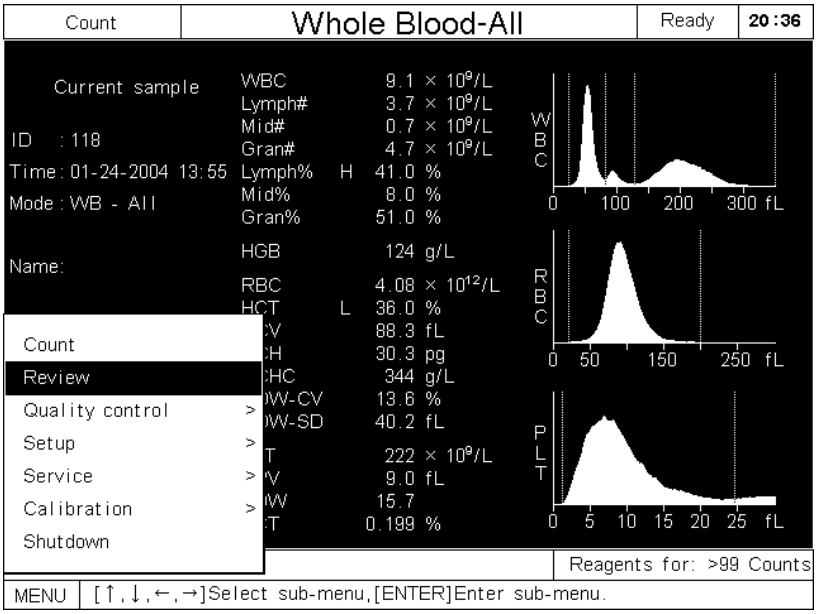


Figure 6-1 Entering Review screen

Press [ENTER] to enter the ***Review*** screen, as Figure 6-2 shows.

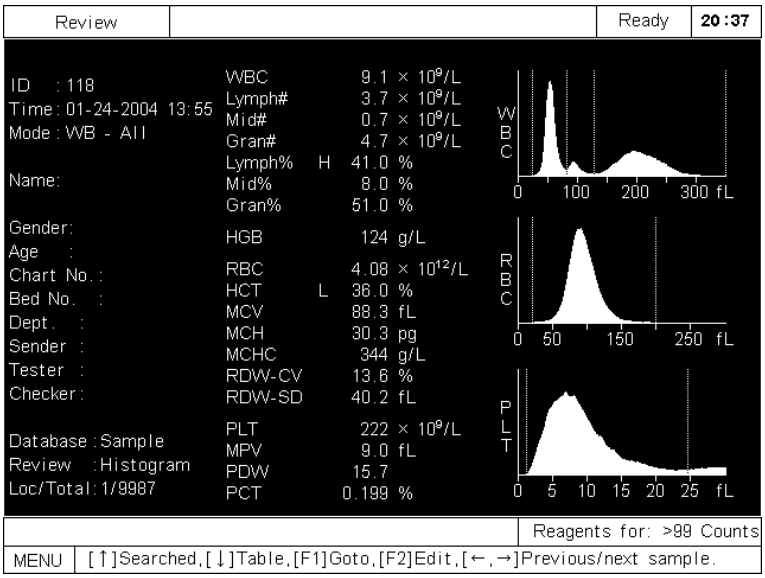


Figure 6-2 Review screen

This analyzer saves analysis results to two databases – the ***Sample*** database, which stores the sample analysis results, and the ***Searched*** database, which only stores the sample results matching the search conditions (see **Chapter 6.2.5**, **Search**, for detailed information). To

review the results saved in either of the databases, you must first set that database as the ***Database*** by pressing [↑] at the ***Review*** screen. The sample results saved in either of the two databases are lined in the order of time, the newest result always at **Location** 1. Figure 6-2 shows the first sample result saved in the ***Sample*** database, which is housing 10,000 sample results ***(Loc./Total: 1/9987***). The ***ID*** of this sample is **118** and it was analyzed in the ***WB–All*** mode and saved at ***01-24-2004 13:56.***

If you want to print out the displayed result, press [PRINT]. If you want to acquire help information, press [HELP]. If you wan to switch to exit the Review screen, press [MENU] and access the desired screen from there.

6.1.1 Reviewing Result of a Specific Sample

In the Histogram mode and at the Review screen, if you want to review the result of a specific sample, you may

1. Press [←] or [→] to move the cursor to the previous or next sample until the desired one is reached. Or

2. Press [PgUp] or [PgDn] to jump backward or forward by 8 samples (for example, jump from location 1 to 9 or reversely) until the desired one is reached. Or

3. Follow the steps given below to go directly to the desired sample.

- Press [F1] to enter the ***Goto*** screen, as Figure 6-3 shows.
- Press[←] or [→] to move the cursor within the edit box right of ***Location*** and press [PgUp] or [PgDn](or the numeric keys on a keyboard) to enter a digit at the position where the cursor is located.
- When you are done entering the target location, press [ENTER] to return to the ***Review*** screen to see the selected result.

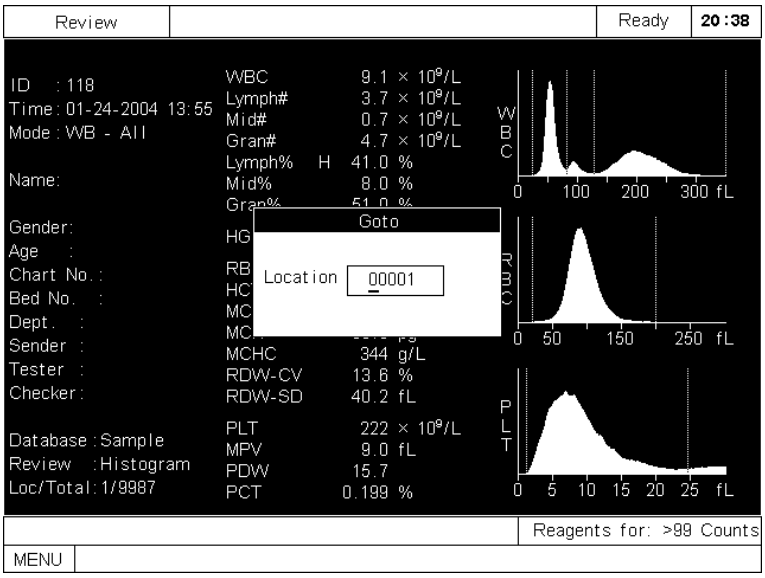


Figure 6-3 Goto screen

6.1.2 Editing Sample Information (if configured)

In the ***Histogram*** mode and at the ***Review*** screen, you may edit the sample information of the currently displayed sample. Press [F2] to enter the ***Edit sample info*** screen, as Figure 6-4 shows. Follow the steps introduced in **Chapter 2.5.1** to edit and save the sample information except for the ***ID***, which is for reviewing only and should not be changed.

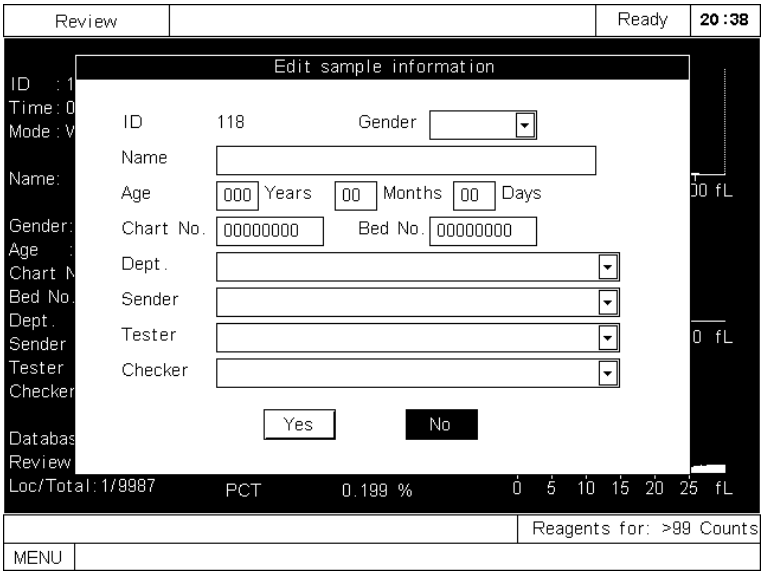


Figure 6-4 Sample edit screen

6.1.3 Adjusting Histograms

In the ***Histogram*** mode and at the ***Review*** screen, you can also follow the steps introduced in **Chapter 2.7.5**, to adjust the displayed histograms manually.

6.2 Review in Table Mode

At the ***Review*** screen and in the ***Histogram*** mode and, press[↓] to enter the ***Table*** mode, as Figure6-5 shows. To review the sample results saved in either the ***Sample*** or ***Searched*** database, you also must first set the desired database as the ***Database*** by pressing [↑].

Review | Ready | 20:39

ID	118	117	116	115	114	113	112	111
Time	01-24-04 13:55	01-24-04 13:53	01-24-04 13:51	01-24-04 13:48	01-24-04 13:46	01-24-04 13:44	01-24-04 13:40	01-24-04 13:38
WBC	9.1	9.5	9.4	9.2	9.2	9.5	9.2	9.4
Lymph#	3.7	3.9	3.9	3.8	3.8	3.9	3.9	3.9
Mid#	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Gran#	4.7	4.9	4.8	4.7	4.7	4.9	4.6	4.8
Lymph%	41.0 H	40.9 H	41.6 H	41.0 H	41.8 H	40.9 H	42.3 H	41.2 H
Mid%	8.0	7.7	7.4	7.5	7.5	7.3	7.2	7.4
Gran%	51.0	51.4	51.0	51.5	50.7	51.8	50.5	51.4
HGB	124	125	124	126	125	126	127	124
RBC	4.08	4.25	4.13	4.26	4.27	4.31	4.20	4.25
HCT	36.0 L	37.1	36.2 L	37.4	37.5	37.8	36.8 L	37.1
MCV	88.3	87.4	87.8	88.0	87.9	87.9	87.8	87.5
MCH	30.3	29.4	30.0	29.5	29.2	29.2	30.2	29.1
MCHC	344	336	342	336	333	333	345	334
RDW-CV	13.6	14.0	13.3	13.7	13.3	14.0	13.3	14.0
RDW-SD	40.2	40.9	40.9	40.9	40.2	40.9	40.9	40.2
PLT	222	270	219	264	234	249	236	230
MPV	9.0	9.1	9.1	8.9	9.3	9.2	9.2	9.4
PDW	15.7	15.9	15.8	15.9	15.6	15.6	15.8	15.8
PCT	0.199	0.245	0.199	0.234	0.217	0.229	0.217	0.216

Database:Sample Review:Table Loc/Total: 1/9987

Reagents for: >99 Counts

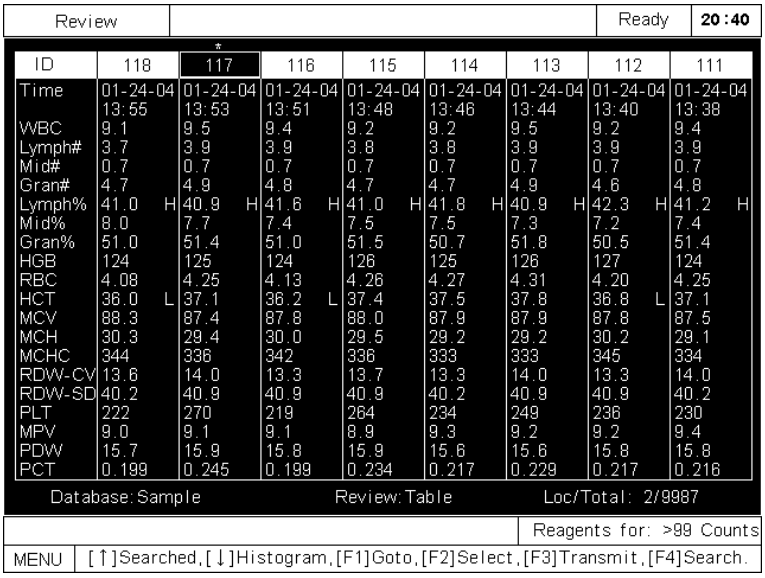
MENU | [↑]Searched,[↓]Histogram,[F1]Goto,[F2]Select,[F3]Transmit,[F4]Search.

Figure 6-5 Sample table

The results saved in the chosen database are displayed on the screen, 8 results for one screen, sequentially from Location 1. You can press [PgUp] or [PgDn] to switch among the screens. If you want to acquire help information, press [HELP]. If you want to exit, press [MENU] to enter the system menu and access the desired screen from there.

6.2.1 Reviewing Result of a Specific Sample

In the ***Table*** mode, you can also follow the steps introduced in **Chapter 6.1.1** to review the result of a specific sample. The selected sample is marked ***** above its ID, as Figure 6-6 shows (the sample, ***ID 117***, is selected).



Review							Ready	20:40
ID	118	* 117	116	115	114	113	112	111
Time	01-24-04 13:55	01-24-04 13:53	01-24-04 13:51	01-24-04 13:48	01-24-04 13:46	01-24-04 13:44	01-24-04 13:40	01-24-04 13:38
WBC	9.1	9.5	9.4	9.2	9.2	9.5	9.2	9.4
Lymph#	3.7	3.9	3.9	3.8	3.8	3.9	3.9	3.9
Mid#	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Gran#	4.7	4.9	4.8	4.7	4.7	4.9	4.6	4.8
Lymph%	41.0 H	40.9 H	41.6 H	41.0 H	41.8 H	40.9 H	42.3 H	41.2 H
Mid%	8.0	7.7	7.4	7.5	7.5	7.3	7.2	7.4
Gran%	51.0	51.4	51.0	51.5	50.7	51.8	50.5	51.4
HGB	124	125	124	126	125	126	127	124
RBC	4.08	4.25	4.13	4.26	4.27	4.31	4.20	4.25
HCT	36.0 L	37.1	36.2 L	37.4	37.5	37.8	36.8 L	37.1
MCV	88.3	87.4	87.8	88.0	87.9	87.9	87.8	87.5
MCH	30.3	29.4	30.0	29.5	29.2	29.2	30.2	29.1
MCHC	344	336	342	336	333	333	345	334
RDW-CV	13.6	14.0	13.3	13.7	13.3	14.0	13.3	14.0
RDW-SD	40.2	40.9	40.9	40.9	40.2	40.9	40.9	40.2
PLT	222	270	219	264	234	249	236	230
MPV	9.0	9.1	9.1	8.9	9.3	9.2	9.2	9.4
PDW	15.7	15.9	15.8	15.9	15.6	15.6	15.8	15.8
PCT	0.199	0.245	0.199	0.234	0.217	0.229	0.217	0.216

Database:Sample Review:Table Loc/Total: 2/9987

Reagents for: >99 Counts

MENU [↑]Searched,[↓]Histogram,[F1]Goto,[F2]Select,[F3]Transmit,[F4]Search.

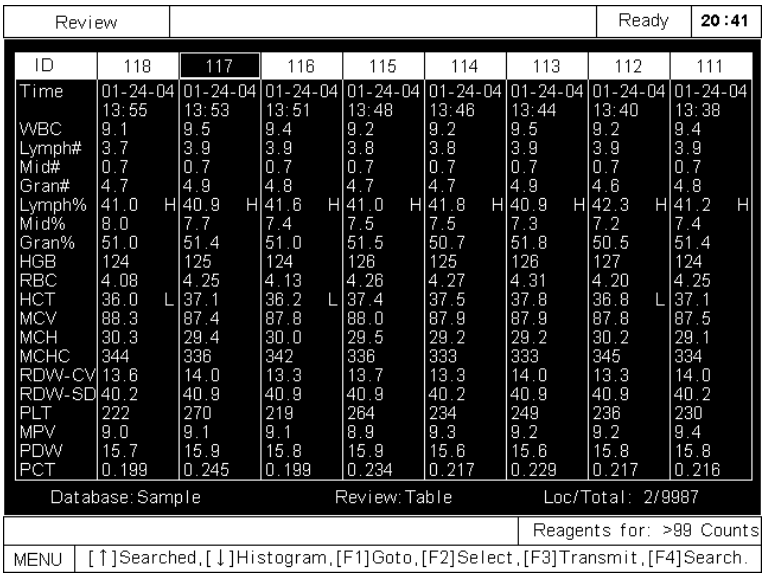
Figure 6-6 Select a sample

6.2.2 **Selecting Results**

In the Table mode, you can select the results of several samples for such operations as deletion, transmission and the like.

1. To select/de-select single result

- Press [←] or [→] to move the cursor to the desired sample result.
- Press [ENTER] to select or de-select that result. The selected result will be marked * above its ID, as the sample 117 shown in Figure 6-6. The * disappears once the sample result is de-selected, as the sample 117 shown in Figure 6-7.



Review							Ready	20:41
ID	118	117	116	115	114	113	112	111
Time	01-24-04 13:55	01-24-04 13:53	01-24-04 13:51	01-24-04 13:48	01-24-04 13:46	01-24-04 13:44	01-24-04 13:40	01-24-04 13:38
WBC	9.1	9.5	9.4	9.2	9.2	9.5	9.2	9.4
Lymph#	3.7	3.9	3.9	3.8	3.8	3.9	3.9	3.9
Mid#	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Gran#	4.7	4.9	4.8	4.7	4.7	4.9	4.6	4.8
Lymph%	41.0 H	40.9 H	41.6 H	41.0 H	41.8 H	40.9 H	42.3 H	41.2 H
Mid%	8.0	7.7	7.4	7.5	7.5	7.3	7.2	7.4
Gran%	51.0	51.4	51.0	51.5	50.7	51.8	50.5	51.4
HGB	124	125	124	126	125	126	127	124
RBC	4.08	4.25	4.13	4.26	4.27	4.31	4.20	4.25
HCT	36.0 L	37.1	36.2 L	37.4	37.5	37.8	36.8 L	37.1
MCV	88.3	87.4	87.8	88.0	87.9	87.9	87.8	87.5
MCH	30.3	29.4	30.0	29.5	29.2	29.2	30.2	29.1
MCHC	344	336	342	336	333	333	345	334
RDW-CV	13.6	14.0	13.3	13.7	13.3	14.0	13.3	14.0
RDW-SD	40.2	40.9	40.9	40.9	40.2	40.9	40.9	40.2
PLT	222	270	219	264	234	249	236	230
MPV	9.0	9.1	9.1	8.9	9.3	9.2	9.2	9.4
PDW	15.7	15.9	15.8	15.9	15.6	15.6	15.8	15.8
PCT	0.199	0.245	0.199	0.234	0.217	0.229	0.217	0.216

Database:Sample Review:Table Loc/Total: 2/9987

Reagents for: >99 Counts

MENU [↑]Searched,[↓]Histogram,[F1]Goto,[F2]Select,[F3]Transmit,[F4]Search.

Figure 6-7 De-select a sample

2. To select/de-select multiple results

Example 1：Assuming you want to select (or de-select) the sample results from Location 1 to Location 5 (ID 118～114) in Figure 6-7, follow the steps given below to do so:

- Press [F2] to enter the ***Select*** screen, as Figure 6-8 shows.

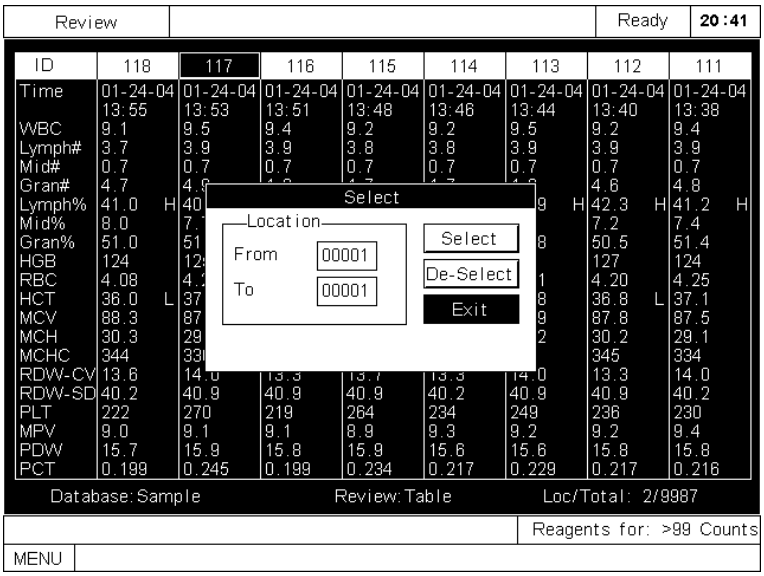


Figure 6-8 Select screen

- To enter the start location 00001, press [↑] or [↓] to move the cursor to the edit box right of From; press [←] or [→] to move the cursor within the box; press [PgUp] or [PgDn] (or the numeric keys of a keyboard) to enter the digit at the position where the cursor is located.
- To enter the end location 00005, press [↑] or [↓] to move the cursor to the edit box right of To; press [←] or [→] to move the cursor within the box; press [PgUp] or [PgDn](or the numeric keys of a keyboard) to enter the digit at the position where the cursor is located.
- Press [↑] or [↓] to move the cursor to Select (or de-select), as Figure 6-9 (or Figure 6-10)shows.

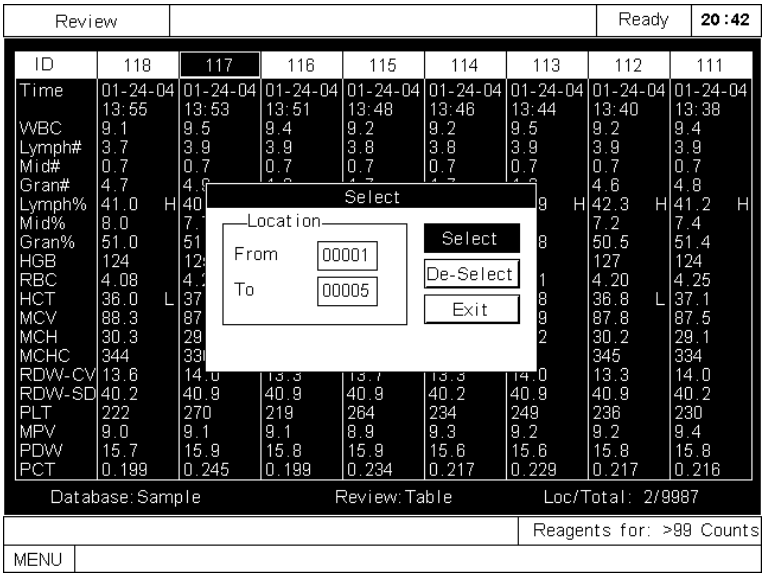


Figure 6-9 Select 5 samples

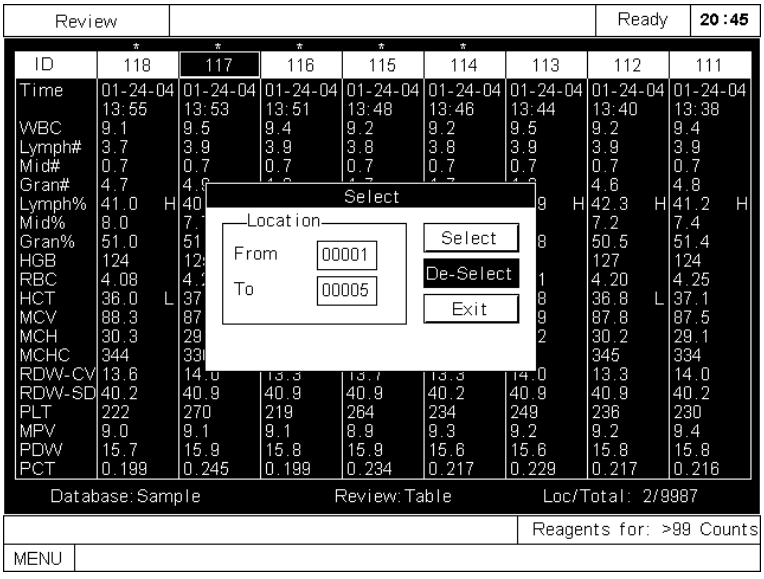
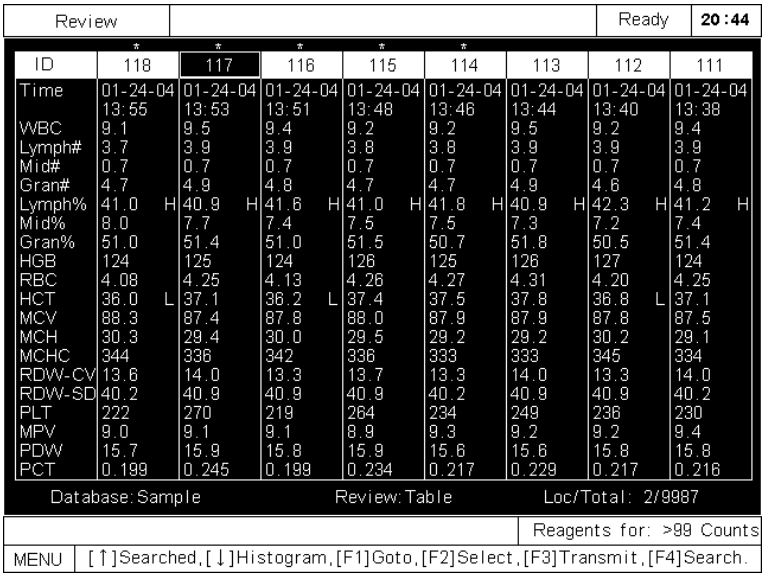


Figure 6-10 De-select 5 samples

- Press [ENTER] to confirm the selection (or de-selection).
- Press[↑] or [↓] to move the cursor to ***Exit*** and press [ENTER] to return to the ***Review*** screen to see the selected (or de-selected) results, as Figure 6-10 (or Figure 6-12)shows.



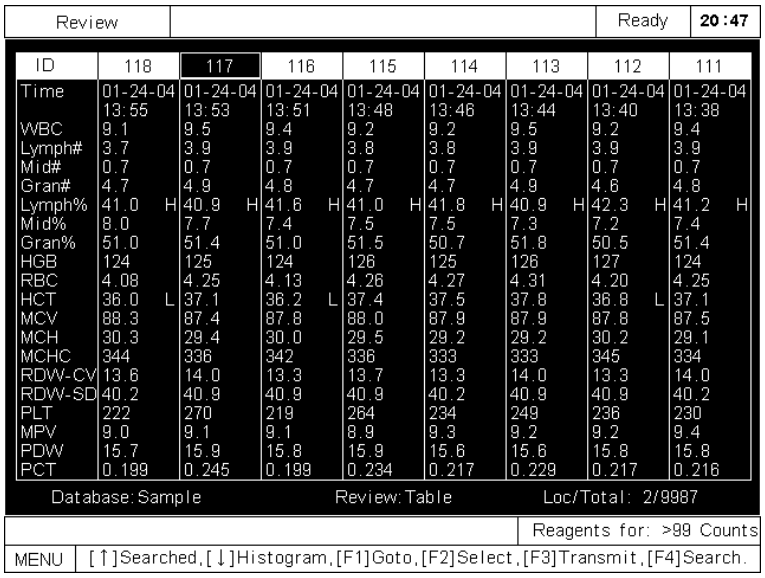
Review						Ready	20:44
ID	118	117	116	115	114	113	112	111
Time	01-24-04 13:55	01-24-04 13:53	01-24-04 13:51	01-24-04 13:48	01-24-04 13:46	01-24-04 13:44	01-24-04 13:40	01-24-04 13:38
WBC	9.1	9.5	9.4	9.2	9.2	9.5	9.2	9.4
Lymph#	3.7	3.9	3.9	3.8	3.8	3.9	3.9	3.9
Mid#	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Gran#	4.7	4.9	4.8	4.7	4.7	4.9	4.6	4.8
Lymph%	41.0 H	40.9 H	41.6 H	41.0 H	41.8 H	40.9 H	42.3 H	41.2 H
Mid%	8.0	7.7	7.4	7.5	7.5	7.3	7.2	7.4
Gran%	51.0	51.4	51.0	51.5	50.7	51.8	50.5	51.4
HGB	124	125	124	126	125	126	127	124
RBC	4.08	4.25	4.13	4.26	4.27	4.31	4.20	4.25
HCT	36.0 L	37.1	36.2 L	37.4	37.5	37.8	36.8 L	37.1
MCV	88.3	87.4	87.8	88.0	87.9	87.9	87.8	87.5
MCH	30.3	29.4	30.0	29.5	29.2	29.2	30.2	29.1
MCHC	344	336	342	336	333	333	345	334
RDW-CV	13.6	14.0	13.3	13.7	13.3	14.0	13.3	14.0
RDW-SD	40.2	40.9	40.9	40.9	40.2	40.9	40.9	40.2
PLT	222	270	219	264	234	249	236	230
MPV	9.0	9.1	9.1	8.9	9.3	9.2	9.2	9.4
PDW	15.7	15.9	15.8	15.9	15.6	15.6	15.8	15.8
PCT	0.199	0.245	0.199	0.234	0.217	0.229	0.217	0.216

Database: Sample Review: Table Loc/Total: 2/9987

Reagents for: >99 Counts

MENU [↑]Searched,[↓]Histogram,[F1]Goto,[F2]Select,[F3]Transmit,[F4]Search.

Figure 6-11 Five samples selected



Review						Ready	20:47
ID	118	117	116	115	114	113	112	111
Time	01-24-04 13:55	01-24-04 13:53	01-24-04 13:51	01-24-04 13:48	01-24-04 13:46	01-24-04 13:44	01-24-04 13:40	01-24-04 13:38
WBC	9.1	9.5	9.4	9.2	9.2	9.5	9.2	9.4
Lymph#	3.7	3.9	3.9	3.8	3.8	3.9	3.9	3.9
Mid#	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Gran#	4.7	4.9	4.8	4.7	4.7	4.9	4.6	4.8
Lymph%	41.0 H	40.9 H	41.6 H	41.0 H	41.8 H	40.9 H	42.3 H	41.2 H
Mid%	8.0	7.7	7.4	7.5	7.5	7.3	7.2	7.4
Gran%	51.0	51.4	51.0	51.5	50.7	51.8	50.5	51.4
HGB	124	125	124	126	125	126	127	124
RBC	4.08	4.25	4.13	4.26	4.27	4.31	4.20	4.25
HCT	36.0 L	37.1	36.2 L	37.4	37.5	37.8	36.8 L	37.1
MCV	88.3	87.4	87.8	88.0	87.9	87.9	87.8	87.5
MCH	30.3	29.4	30.0	29.5	29.2	29.2	30.2	29.1
MCHC	344	336	342	336	333	333	345	334
RDW-CV	13.6	14.0	13.3	13.7	13.3	14.0	13.3	14.0
RDW-SD	40.2	40.9	40.9	40.9	40.2	40.9	40.9	40.2
PLT	222	270	219	264	234	249	236	230
MPV	9.0	9.1	9.1	8.9	9.3	9.2	9.2	9.4
PDW	15.7	15.9	15.8	15.9	15.6	15.6	15.8	15.8
PCT	0.199	0.245	0.199	0.234	0.217	0.229	0.217	0.216

Database: Sample Review: Table Loc/Total: 2/9987

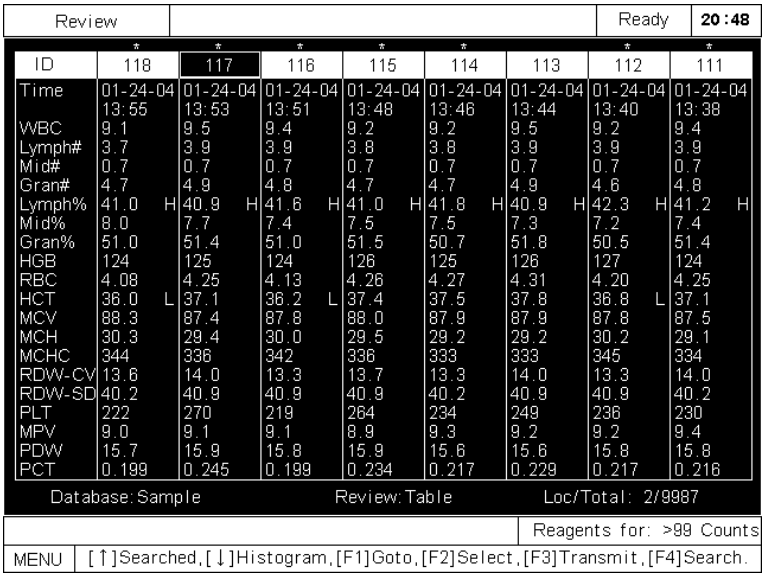
Reagents for: >99 Counts

MENU [↑]Searched,[↓]Histogram,[F1]Goto,[F2]Select,[F3]Transmit,[F4]Search.

Figure 6-12 Five samples de-selected

Example 2：You can also select (or de-select) the results of multiple discontinued ranges. If you want to select the sample results from Location 1 to Location 5 and from Location 7 to Location 8 in Figure 6-12, follow the steps given below to do so:

- Follow the steps (1) - (5) introduced in **Example 1** to select (or de-select) the sample results from Location 1 to Location 5.
- Press [↑] or [↓] to move the cursor back to ***From*** and follow the steps (1) - (5) introduced in **Example 1** to select (or de-select) the sample results from Location 7 to Location 8.
- Press [↑] or [↓] to move the cursor to Exit and press [ENTER] to return to the ***Review*** screen to view the selected (or de-selected) sample results, as Figure 6-13 (or Figure 6-14) shows.



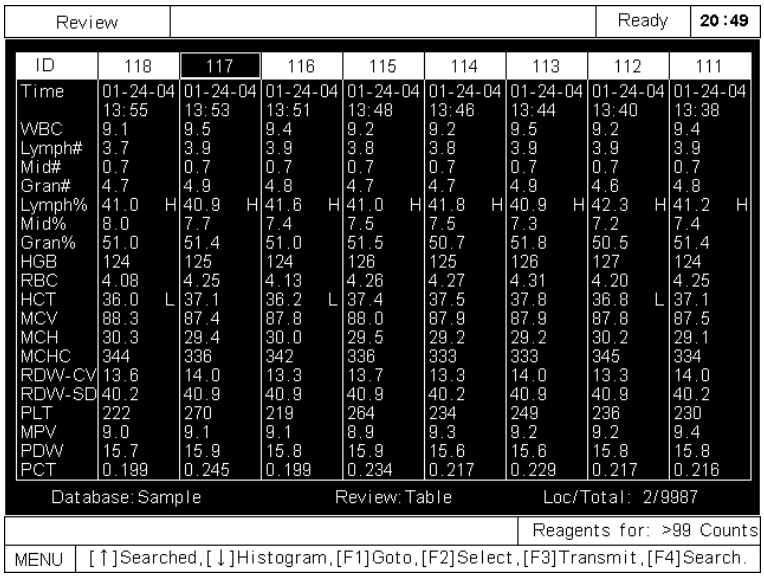
Review							Ready	20:48
ID	118	117	116	115	114	113	112	111
Time	01-24-04 13:55	01-24-04 13:53	01-24-04 13:51	01-24-04 13:48	01-24-04 13:46	01-24-04 13:44	01-24-04 13:40	01-24-04 13:38
WBC	9.1	9.5	9.4	9.2	9.2	9.5	9.2	9.4
Lymph#	3.7	3.9	3.9	3.8	3.8	3.9	3.9	3.9
Mid#	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Gran#	4.7	4.9	4.8	4.7	4.7	4.9	4.6	4.8
Lymph%	41.0 H	40.9 H	41.6 H	41.0 H	41.8 H	40.9 H	42.3 H	41.2 H
Mid%	8.0	7.7	7.4	7.5	7.5	7.3	7.2	7.4
Gran%	51.0	51.4	51.0	51.5	50.7	51.8	50.5	51.4
HGB	124	125	124	126	125	126	127	124
RBC	4.08	4.25	4.13	4.26	4.27	4.31	4.20	4.25
HCT	36.0 L	37.1	36.2 L	37.4	37.5	37.8	36.8 L	37.1
MCV	88.3	87.4	87.8	88.0	87.9	87.9	87.8	87.5
MCH	30.3	29.4	30.0	29.5	29.2	29.2	30.2	29.1
MCHC	344	336	342	336	333	333	345	334
RDW-CV	13.6	14.0	13.3	13.7	13.3	14.0	13.3	14.0
RDW-SD	40.2	40.9	40.9	40.9	40.2	40.9	40.9	40.2
PLT	222	270	219	264	234	249	236	230
MPV	9.0	9.1	9.1	8.9	9.3	9.2	9.2	9.4
PDW	15.7	15.9	15.8	15.9	15.6	15.6	15.8	15.8
PCT	0.199	0.245	0.199	0.234	0.217	0.229	0.217	0.216

Database:Sample Review:Table Loc/Total: 2/9987

Reagents for: >99 Counts

MENU [↑]Searched,[↓]Histogram,[F1]Goto,[F2]Select,[F3]Transmit,[F4]Search.

Figure 6-13 Discontinued samples selected



Review							Ready	20:49
ID	118	117	116	115	114	113	112	111
Time	01-24-04 13:55	01-24-04 13:53	01-24-04 13:51	01-24-04 13:48	01-24-04 13:46	01-24-04 13:44	01-24-04 13:40	01-24-04 13:38
WBC	9.1	9.5	9.4	9.2	9.2	9.5	9.2	9.4
Lymph#	3.7	3.9	3.9	3.8	3.8	3.9	3.9	3.9
Mid#	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Gran#	4.7	4.9	4.8	4.7	4.7	4.9	4.6	4.8
Lymph%	41.0 H	40.9 H	41.6 H	41.0 H	41.8 H	40.9 H	42.3 H	41.2 H
Mid%	8.0	7.7	7.4	7.5	7.5	7.3	7.2	7.4
Gran%	51.0	51.4	51.0	51.5	50.7	51.8	50.5	51.4
HGB	124	125	124	126	125	126	127	124
RBC	4.08	4.25	4.13	4.26	4.27	4.31	4.20	4.25
HCT	36.0 L	37.1	36.2 L	37.4	37.5	37.8	36.8 L	37.1
MCV	88.3	87.4	87.8	88.0	87.9	87.9	87.8	87.5
MCH	30.3	29.4	30.0	29.5	29.2	29.2	30.2	29.1
MCHC	344	336	342	336	333	333	345	334
RDW-CV	13.6	14.0	13.3	13.7	13.3	14.0	13.3	14.0
RDW-SD	40.2	40.9	40.9	40.9	40.2	40.9	40.9	40.2
PLT	222	270	219	264	234	249	236	230
MPV	9.0	9.1	9.1	8.9	9.3	9.2	9.2	9.4
PDW	15.7	15.9	15.8	15.9	15.6	15.6	15.8	15.8
PCT	0.199	0.245	0.199	0.234	0.217	0.229	0.217	0.216

Database:Sample Review:Table Loc/Total: 2/9987

Reagents for: >99 Counts

MENU [↑]Searched,[↓]Histogram,[F1]Goto,[F2]Select,[F3]Transmit,[F4]Search.

Figure 6-14 Discontinued samples de-selected

6.2.3 **Deleting Selected Results**

If you want to delete the selected sample results, follow the steps given below to do so.

- At the ***Review*** screen, press [DEL] and a dialog box shown will pop up to confirm the deletion as Figure 6-15 shows. You may
- Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to confirm the deletion. Or
- Press [←] or [→] to move the cursor ***No*** and press [ENTER] to abort the deletion.

Figure 6-14 Confirm deletion

Note that you can only delete the selected sample results. If you press [DEL] with no sample results selected, a dialog box will pop up to remind you to select sample results, as Figure 6-16 shows. You need to press [ENTER] to return to the ***Review*** screen and follow the steps mentioned above to select the sample results to be deleted.

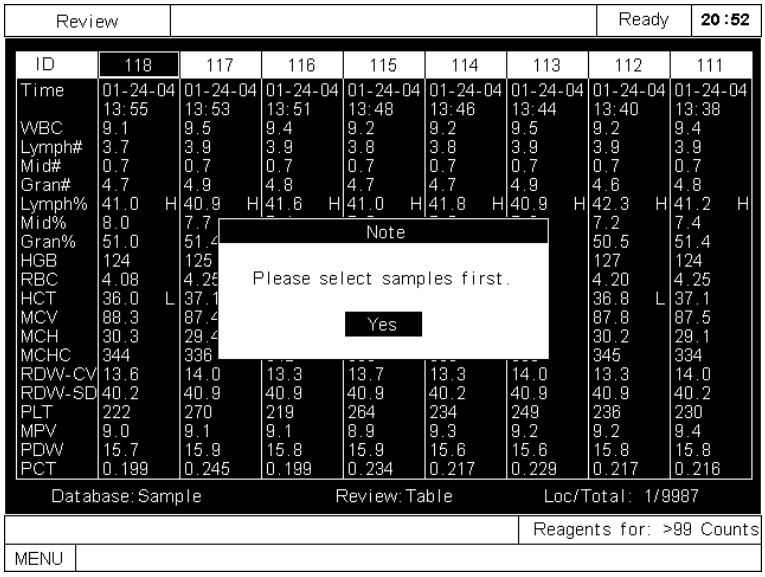


Figure 6-15 Remind you to select samples first

6.2.4 **Transmission**

If you want to transmit sample results to an external computer, follow the steps given below to do so.

- At the ***Review*** screen, press [F3] to enter the ***Transmission*** screen, as Figure 6-17 shows. At this screen, you may
- Press [↑] or [↓] to move the cursor to ***Selected*** and press [ENTER] to transmit the

selected sample results to an external computer. Or

- Press [↑] or [↓] to move the cursor to ***All*** and press [ENTER] to transmit all the saved sample results in either the ***Sample*** or ***Searched*** database to an external computer. Or
- Press [↑] or [↓] to move the cursor to ***Stop*** and press [ENTER] to stop the transmission. Or
- Press [↑] or [↓] to ***Exit*** to return to the ***Review*** screen.

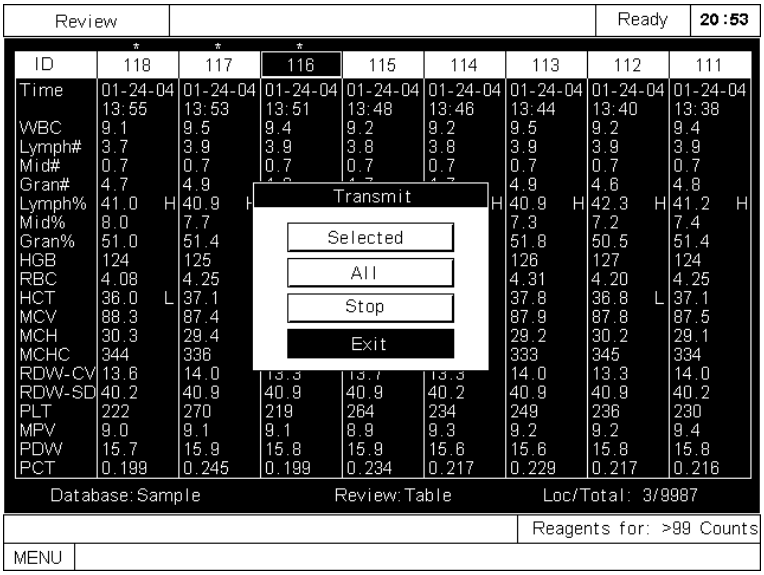


Figure 6-17Transmission screen

6.2.5 **Searching Results**

If you want to search the ***Sample*** database for the certain results, press [F4] at the ***Review*** screen to enter the ***Search*** screen, as Figure 6-18 shows. Follow the steps given below to specify any of the 7 search conditions listed in Figure 6-18.

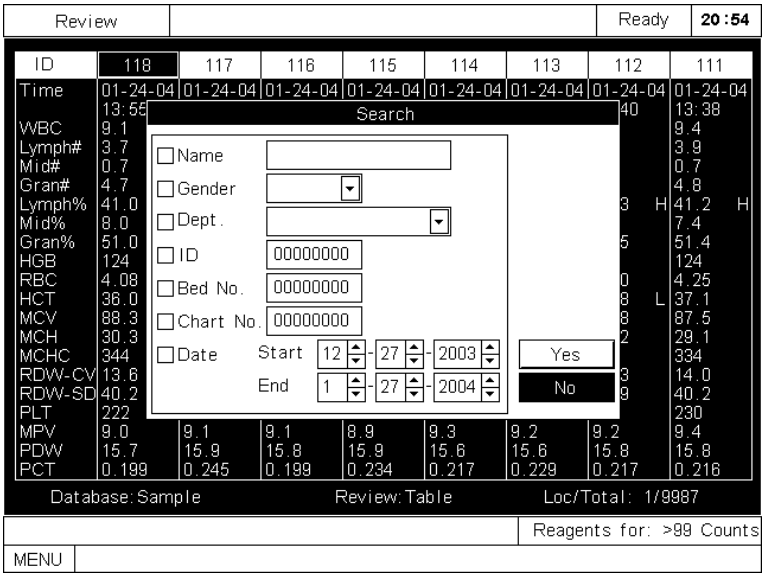


Figure 6-18 Search conditions

1. To specify the name of the patient, you may
- Press [↑] or [↓] to move the cursor to the check box left of ***Name***.
- Press [ENTER] to tick the box.
- Press [↓] to move the cursor to the edit box right of ***Name*** and use an external keyboard to enter the name of the patient to be searched.
- Press [↓] to move the cursor to the next search condition to be specified.

2. To specify the Gender of the patient, you may
- Press [↑] or [↓] to move the cursor to the check box left of ***Gender***.
- Press [ENTER] to tick the box.
- Press [↓] to move the cursor to the edit box right of ***Gender*** and press [ENTER] to display the pull-down menu.
- Press [↑] or [↓] to select ***Male*** for the male patient, or ***Female*** for the female patient, or blank for the patient whose gender you are unaware of.
- Press [↑] or [↓] to move the cursor to the next search condition to be specified.

3. To specify the department from which the sample came, you may
- Press [↑] or [↓] to move the cursor to the check box left of ***Dept.***.
- Press [ENTER] to tick the box.
- Press [↓] to move the cursor to the edit box right of ***Dept.***. Use an external keyboard to enter the name of the department. This edit box automatically saves the entered item to its pull-down menu, which can be accessed by pressing [ENTER]. You may press [↑] or [↓] to move the cursor to the interested item and press [ENTER] to select it.
- Press [↑] or [↓] to move the cursor to the next search condition to be specified.

4. To specify the ID of the sample, you may
- Press [↑] or [↓] to move the cursor to the check box left of ***ID***.
- Press [ENTER] to tick the box.
- Press [↓] to move the cursor to the edit box right of ***ID***. Press [←] or [→] to move the cursor within the box and press [PgUp] or [PgDn] (or the numeric keys of an external keyboard) to enter the digit at the position where the cursor is located.
- When you are done entering the sample ID, press [↑] or [↓] to move the cursor to the next search condition to be specified.

5. To specify the bed number of the patient, you may
- Press [↑] or [↓] to move the cursor to the check box of ***Bed No***..
- Press [ENTER] to tick the box.
- Press [↓] to move the cursor to the edit box right of ***Bed No.***.Press [←] or [→] to move the cursor within the box and press [PgUp] or [PgDn] (or the numeric keys of an external keyboard) to enter the digit at the position where the cursor is located.
- When you are done entering the bed number, press [↑] or [↓] to move the cursor to the next search condition to be specified.

6. To specify the chart number of the patient, you may

- Press [↑] or [↓] to move the cursor to the check box of ***Chart No.***.
- Press [ENTER] to tick the box.
- Press [↓] to move the cursor to the edit box right of ***Bed No.***. Press [←] or [→] to move the cursor within the box and press [PgUp] or [PgDn] (or the numeric keys of an external keyboard) to enter the digit at the position where the cursor is located.
- When you are done entering the chart number, press [↑] or [↓] to move the cursor to the next search condition to be specified.

7. To specify the period of time, you may

- Press [↑] or [↓] to move the cursor to the check box left of ***Date***.
- Press [ENTER] to tick the box.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Start*** and press [PgUp] or [PgDn] to enter the start date in the YYYY-MM-DD format.
- Press [↑] or [↓] to move the cursor to the combo box right of ***End*** and press [PgUp] or [PgDn] to enter the end date in the YYYY-MM-DD format.
- When you are done specifying the period of time, press [↑] or [↓] to move the cursor to the next search condition to be specified.

See Figure 6-19 for what the screen looks like if all conditions are selected.

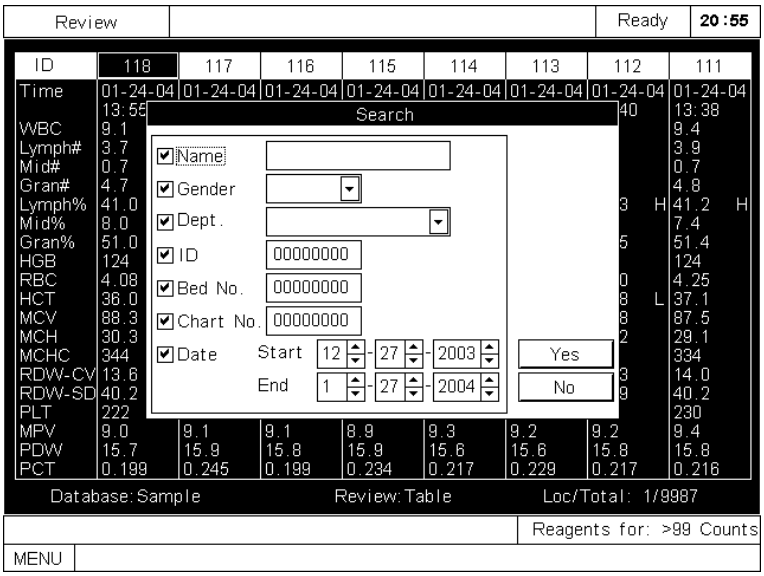


Figure 6-19 All conditions are selected for the search

8. To exit the Search screen and start the search, you may

- Press [↑] or [↓] to move the cursor to ***Yes*** and press [ENTER] to start the search. Or
- Press [↑] or [↓] to move the cursor to ***No*** and press [ENTER] to abort the search and exit to the exit to the ***Review*** screen.

When the search is done, a dialog box will pop up to display the result of the search, as Figure 20 shows. After viewing the dialog box, press [ENTER] to exit. The searched results are saved to the ***Searched*** database, which can only store no more than 500 results of the latest search.

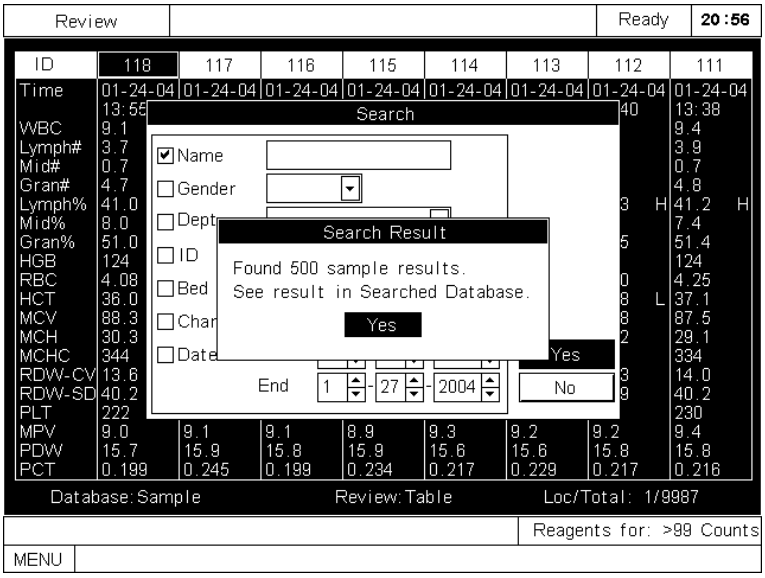


Figure 6-20 Result of the search

You cannot delete the results saved in the ***Searched*** database. If new sample results are added to the ***Sample*** database, or the sample results saved in the ***Sample*** database are changed, the ***Searched*** database will be automatically emptied. Restarting this analyzer will also empty the ***Searched*** database.

6.2.6 Printing

If you want to print out the selected sample results, press [PRINT].

6.2.7 Special Functions

To access the Special Functions screen, you must first select several (1 - 500) sample results and then press [F5] to enter the ***Special Functions*** screen, as Figure 6-21 shows. If you want to print out the displayed data, press [PRINT]. If you want to acquire help information, press [HELP]. If you want to exit the screen, press [MENU].

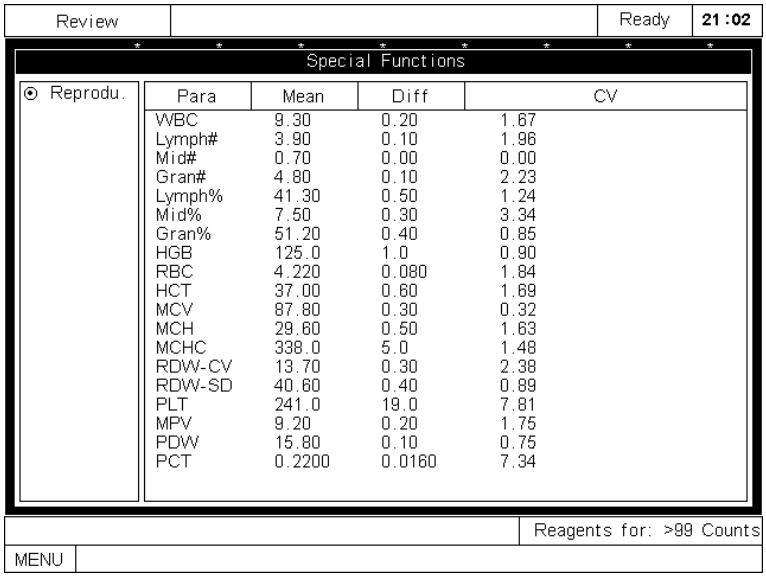


Figure 6-21 Special functions screen open to all users

Two special functions are included in this screen – ***Reprodu.*** and ***Trend***. The former is open to all users, as Figure 6-21 shows, while the latter to administrators only, as Figure6-22 shows.

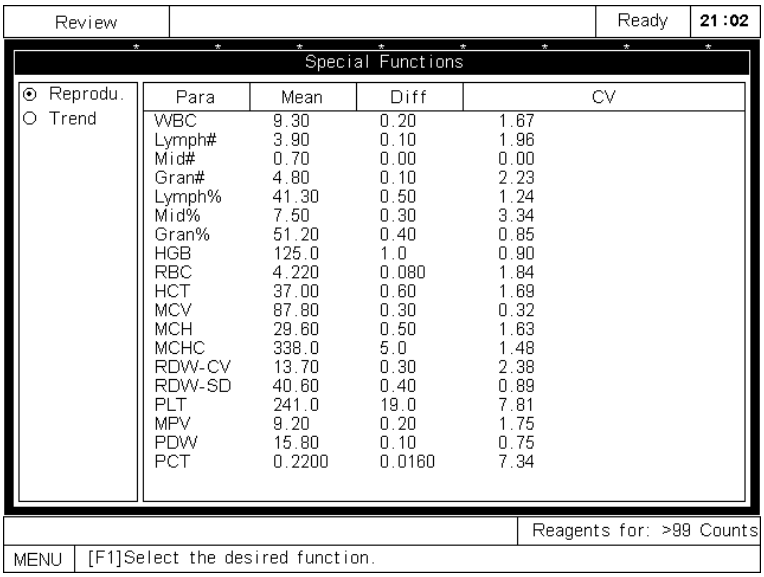


Figure 6-22 Special functions screen open to only administrators

6.2.7.1 **Reproducibility**

See Figure 6-22 for the ***Special Functions*** screen open to all users. The screen consists of two fields, the left displaying the available functions (the common users can only see ***Reprodu.***) and the right displaying the 19 parameters and their reproducibility indices (***Mean***, ***Diff*** and ***CV***).

If the selected samples are less than 3, the reproducibility indices are all 0. If the analysis result of certain parameter is invalid (***), the corresponding index will also be invalid (***).

6.2.7.2 **Trend**

After entering the administrator password (see **Chapter 7.1, Password**), you can enter the ***Special Functions*** screen open to administrators, as Figure 6-22 shows. Press [F1] to access the ***Trend***, which displays the WBC, RBC, PLT, HGB, MCV and RDW-CV trends of the select sample results. The six trends are displayed in two screens, three trends in one, as Figure 6-23 and Figure 6-24 show. You can press [↑][↓] to switch between screens. The selected results are sequentially presented in the trend, newest at the utmost left (No. 1).

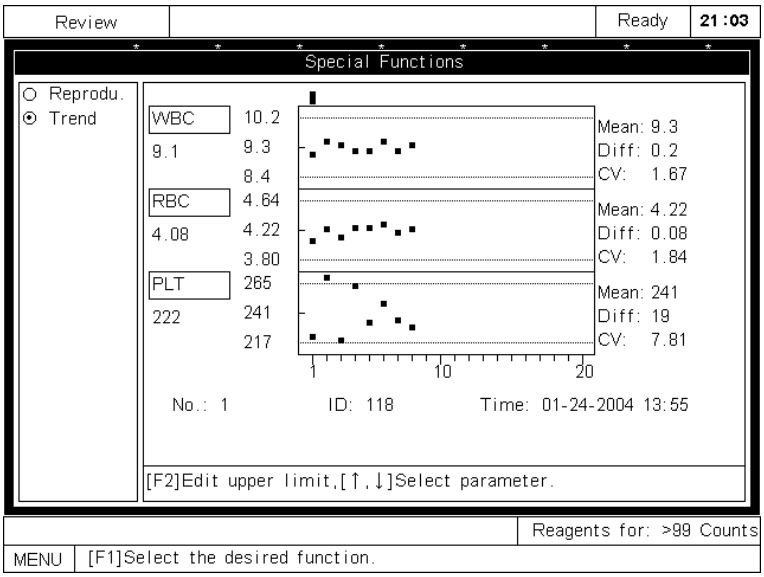


Figure 6-23 Trend screen (1)

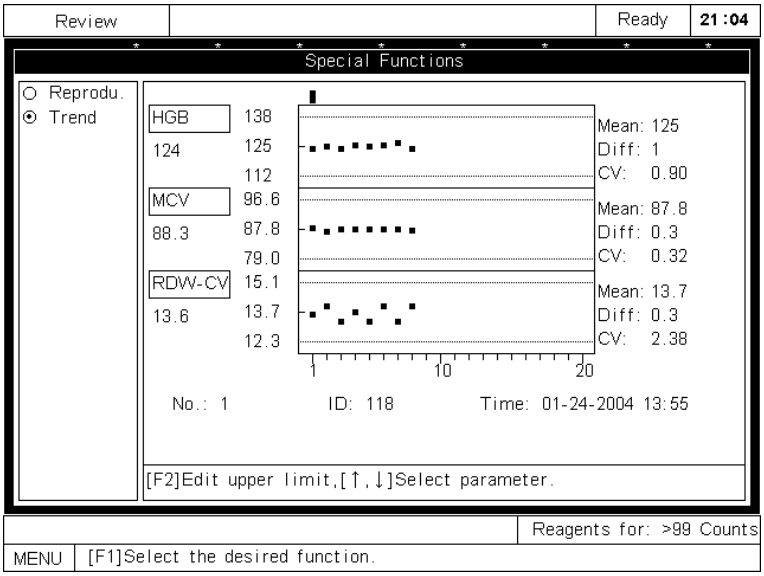


Figure 6-23 Trend screen (2)

At either screen, you can press [←] or [→] to view the results (displayed below the parameter box) of every point presented in the graph. The current cursor position is displayed right of ***No.*** and the time at which the sample was analyzed is displayed right of ***Time***. You can also press [PgUp] or [PgDn] to jump forward or backward by 20 samples.

The trend is interpreted as follows:

1. The x-coordinate represents how many sample results have been selected. The y-coordinate represents the analysis results of the displayed parameters.

2. For every parameter, the upper dash line of its trend represents the upper limit of the expected range, 10% above the mean, of the analysis result. In case of Figure 6-22, the upper limit is ***10.2***.

3. For every parameter, the lower dash line of its trend represents the lower limit of the expected range, 10% below the mean, of the analysis result. In case of Figure 6-22, the lower limit is ***8.4.***

4. For every parameter, its mean is displayed between the values of the upper dash line and of the lower dash line. In case of Figure 6-22, the mean is ***9.3.***

5. For every parameter, the three numbers on the right of its trend represents: :

Mean – the mean value of the saved results

Diff – standard deviation of the saved analysis results

CV% - Coefficient of Variation

If the selected samples are less than 3, the three indices will all be 0. If the analysis result of certain parameter is invalid (***), the three indices will also be invalid (***). Under these two circumstances, the three values on the left of the trends are the parameter's means and expected ranges set by the user (see **Chapter 7.2.6**).

$$\text{Mean} = \frac{\sum_{i=1}^{n} X_i}{n}$$

$$\text{Diff} = \sqrt{\frac{\sum\left(X_i - \text{Mean}\right)^2}{n-1}}$$

$$\text{CV} = \frac{\text{Diff}}{\text{Mean}} \times 100\%$$

where n represents how many sample results are selected and X_i is the result of the i_{th} analysis.

6. Every point in the graph is interpreted as follows:

The darkened square ■ that falls between the upper dash line and the lower dash line is within the expected range. Otherwise, it is not. The blank square □ represents the sample analysis either ran into errors or the result is out of the display range.

Chapter 7 **Setup**

This BC-2800 Auto Hematology Analyzer is already set when delivered to you by the customer service engineers of Mindray or the distributor. But you can still change the settings according to your own needs. Note that you need the administrator password (2826) to change some of the settings.

7.1 **Password**

This analyzer divides the users into two categories – common users and administrators. Some of the settings (such as gain, parameter units, count time and etc.) can only be changed by the administrators.

7.1.1 **Obtaining Administrator Authority**

1. Press [MENU] to enter the system menu and press the appropriate arrow keys ([↑][↓][←][→]) to ***Setup*** → ***Password***, as Figure 7-1 shows.

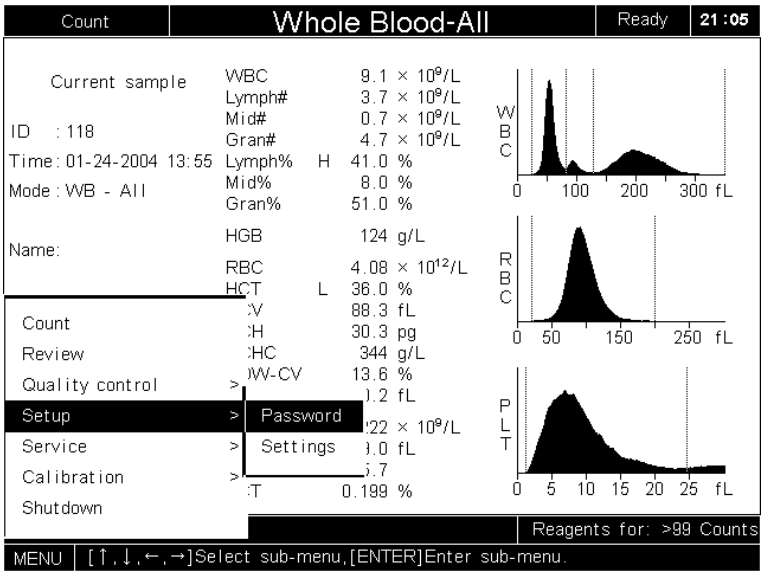


Figure 7-1 Entering the password screen

2. Press [ENTER] to enter the ***Password*** screen, as Figure 7-2 shows. The displayed password is the default common-user password set automatically by this analyzer.

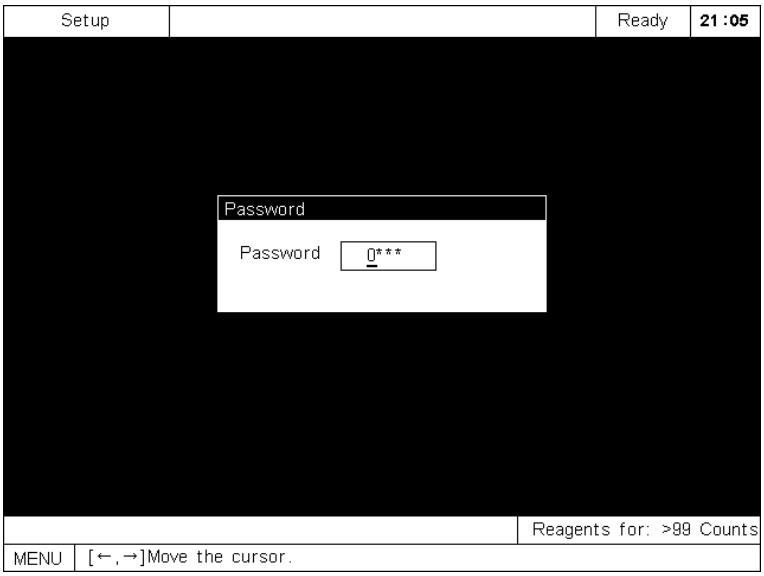


Figure 7-2 Common user password

3. Press [←] or [→] to move the cursor within the edit box right of ***Password.*** Press [PgUp] or [PgDn] (or the numeric keys on a keyboard) to enter a digit at the position where the cursor is located. Note only the digit at which the cursor is located displays the true value and others are covered by * .

4. When you are done entering the password, press [ENTER] to save the password to the system, as Figure 7-3 shows.

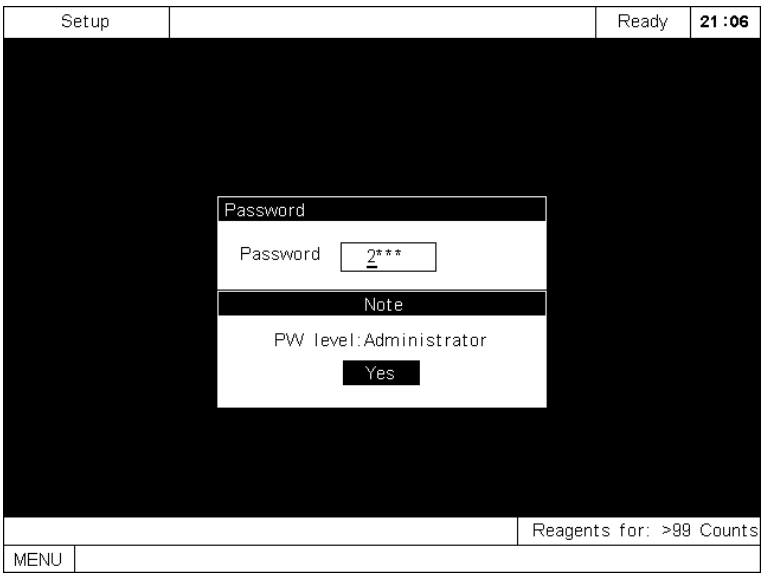


Figure 7-3 Obtain administrator authority

5. Press [MENU] to return to the system menu as the administrator.

7.1.2 Giving Up Administrator Authority

6. Press [MENU] to enter the system menu. Press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Setup*** → ***Password***.

7. Press [ENTER] to enter the ***Password*** screen, in which the default common-user password is displayed.

8. Press [ENTER] to save this password to the system, as Figure 7-4 shows.

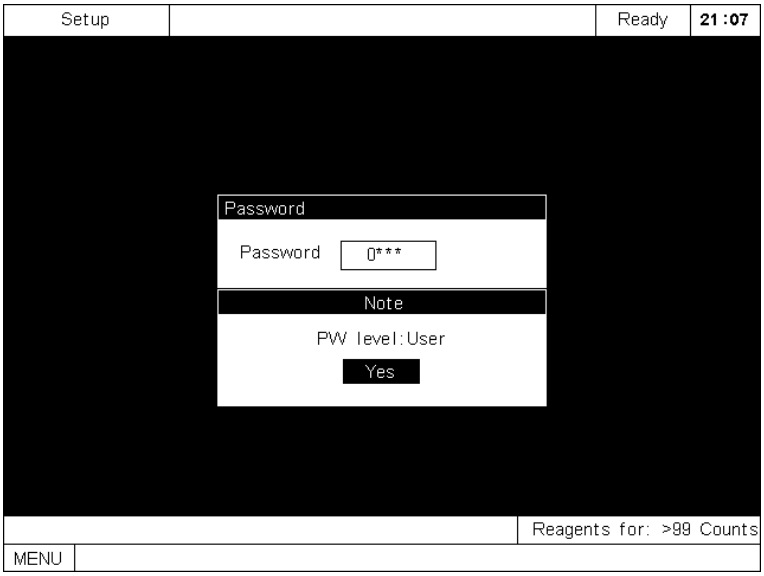


Figure 7-4 Obtaining common user authority

9. Press [MENU] to return to the system menu as the common-user.

7.2 Editing Settings

You many change the system settings to your own need as introduced in the following Chapters.

Press [MENU] to enter the system menu. Press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Setup*** → ***Settings***, as Figure 7-5 shows.

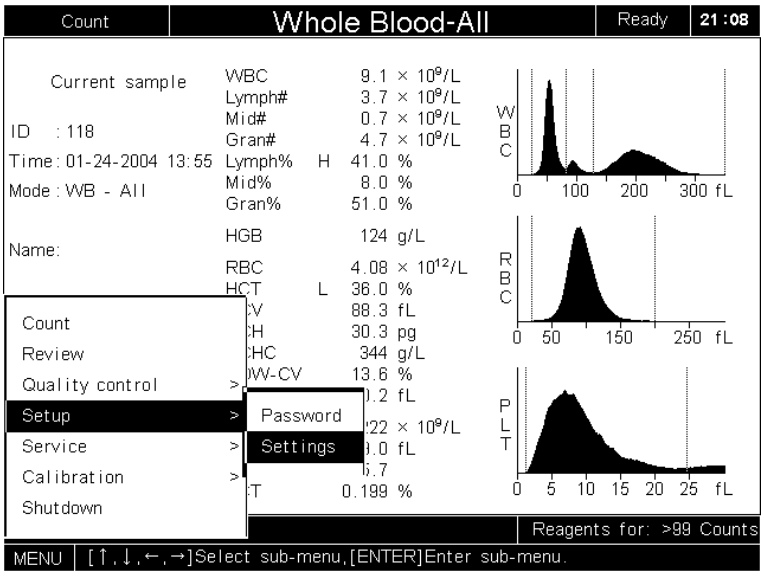


Figure 7-5 Entering Settings screen

Press [ENTER] to enter the ***Settings*** screen as Figure 7-6 shows.

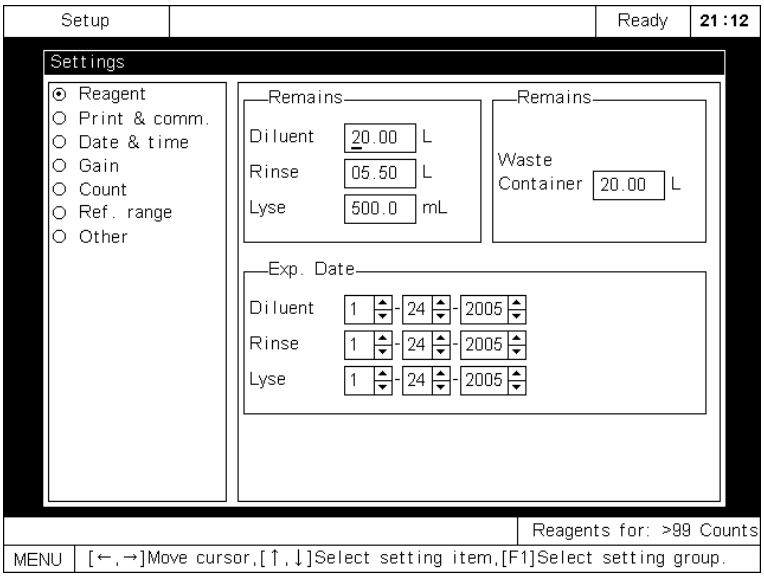


Figure 7-6 Settings screen

This screen is interpreted as follows:

1. **Setting Groups** area

This area displays the visible or changeable setting groups. Press [F1] to select the desired group. The selected group is preceded by a ⊙.

10. **Setting** area

You can change the settings of the items of the selected group in this area.

11. **Help** area

This area displays useful information to help the user to move to the next step.

At this screen, if you want to acquire help information, press [HELP]. If you want to return to the system menu, press [MENU].

7.2.1 **Reagents**

You can change the settings regarding the reagents and the waste at the ***Setup*** screen, as Figure 7-7 shows.

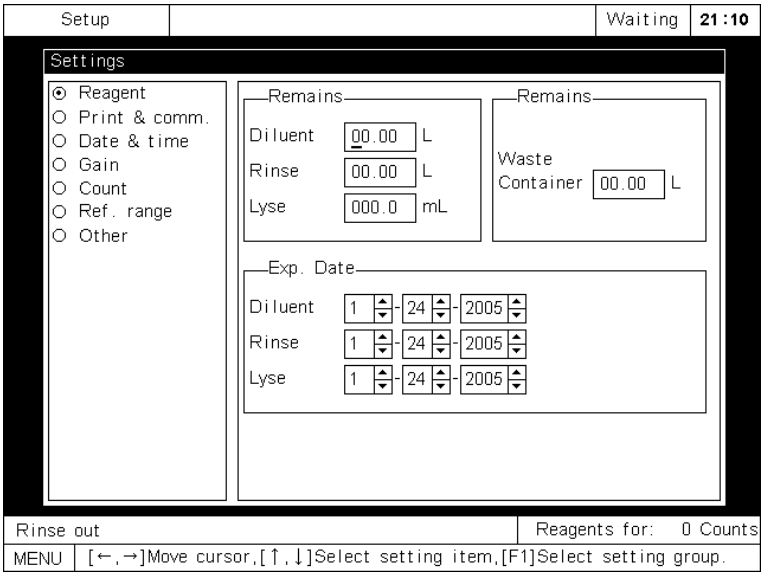


Figure 7-7 Reagent settings

7.2.1.1 Setting remaining volumes for reagents

You may set the remaining volumes for the diluent, rinse and lyse. When any of the entered volumes is counted down to zero, the system will remind the user to replace the corresponding reagent.

1. At the ***Setup*** screen, press [F1] to select ***Reagent*** group.

2. Press [↑] or [↓] to move the cursor to the edit boxes right of ***Diluent***, ***Rinse*** or ***Lyse*** in the ***Remians*** field..

3. Press [←] or [→] to move the cursor within the edit box right of the desired reagent. Press [PgUp] or [PgDn] (or the numeric keys on a keyboard) to enter a digit at the position where the

cursor is located. Note that this analyzer has an internal fixed decimal point and you can just enter the digits ignoring the decimal point. See Table 7-1 for the valid reagent volumes.

Table 7-1 Valid reagents volumes

	Diluent	Rinse	Lyse
Allowed range	(0-30.0) L	(0-30.0) L	(0-999) mL

4. When you are done entering the remaining volume, press [↑] or [↓] to move the cursor to other settings to be changed.

7.2.1.2 Entering usable volume of the waste container

You may enter the usable volume of the waste container. When the system counts down the entered volume to 0, it will alert the user to empty the waste container. Follow the steps given below to set the volume.

1. At the Setup screen, press [F1] to select the Reagent group.
2. Press [↑] or [↓] to move the cursor to the edit box right of Container.
3. Press [←] or [→] to move the cursor within the edit box . Press [PgUp] or [PgDn] (or the numeric keys on a keyboard) to enter a digit at the position where the cursor is located. Note that this analyzer has an internal fixed decimal point and you can just enter the digits ignoring the decimal point. The valid usable container volume is 0L～99.9L. Make sure your input is within this range.
4. When you are done entering the volume, press [↑] or [↓] to the next setting to be changed.

7.2.1.3 Entering expiration dates of reagents

You can specify the expiration dates for the diluent, rinse and lyse. Once any of these reagents is expired, the system will alert the user to replace that reagent. Follow the steps given below to enter the expiration dates.

1. At the ***Setup*** screen, press [F1] to select the ***Reagent*** group.
2. Press [↑] or [↓] to move the cursor to the edit box right of the ***Diluent, Rinse*** or ***Lyse*** in the ***Expt. Date*** area.
3. Press [PgUp] or [PgDn] to enter the desired expiration date in the **YYYY-MM-DD** format. Note that the service life of the reagent after being opened is 60 days. The expiration date to be entered should be the open-container date + 60 days or the expiration date marked on the packing of the reagent, whichever is smaller.

For examples：

1) If the rinse container is opened on April 3rd, 2004 and the expiration date marked on the packing is December 15th, you should enter June 3rd, 2004 as the valid expiration date for the rinse.

2) If the rinse container is opened on April 3rd, 2004 and the expiration date marked on the packing is May 5th, you should enter May 5th, 2004 as the valid expiration date for the rinse.

4. When you are done entering the date, press [↑] or [↓] to select the other reagent settings to be changed.

7.2.1.4 Exiting editing reagent settings

When you are done change all the reagent settings you want to change, you may

- press [F1] to select other setting group you want to change, or
- press [MENU] and a dialog box will pop up to remind you to save the changes, as Figure 7-8 shows.. Press [←] or [→] to move the cursor to Yes and press [ENTER] to save the changes and exit to the system menu or move the cursor to No and press [ENTER] to exit to the system menu without saving the changes.

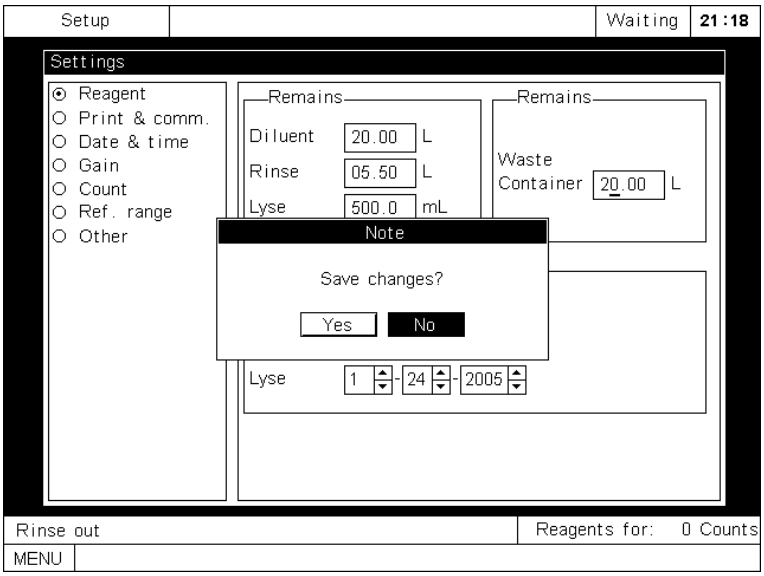


Figure 7-8 Saving changes

Note that if any entered value is beyond the valid range, a dialog box will pop up when you exiting to the system menu. Press [ENTER] to close the dialog box and clear the invalid values.

7.2.1.5 Other operations

2. If you did not change any of the reagent settings, you may press [F1] to select other setting group or press [MENU] to directly exit to the system menu.
3. If you want to acquire help information, press [HELP].

7.2.2 **Printing and Communication Settings**

You change the printing and communication settings to your own need, as Figure 7-9 shows. .

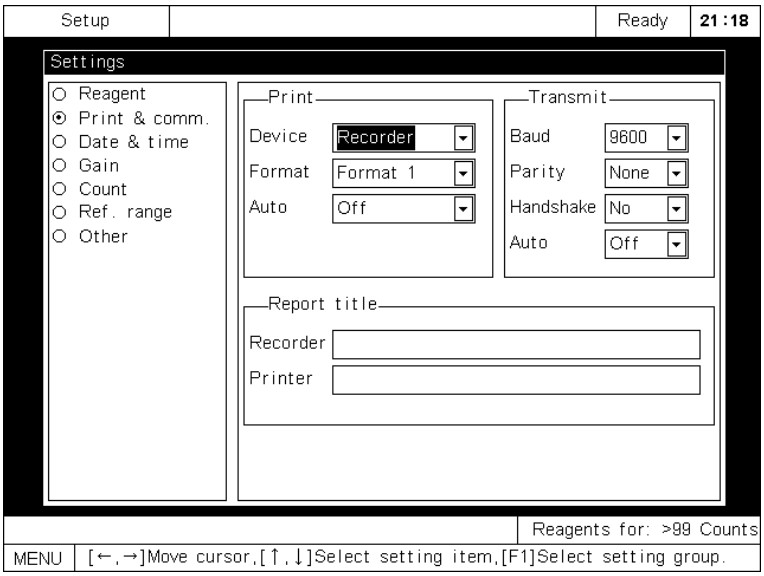


Figure 7-9 Printing and Communication Settings

7.2.2.1 Changing Printing Settings

1. Selecting printing device

You may choose the internal recorder or an external printer (EPSON LQ-300K，EPSON LQ-300K+ or LQ-1600K) as the printing device. Follow the steps given below to do so.

- At the ***Setup*** screen, press [F1] to select the ***Print & comm***. group, as Figure 7-10 shows.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Device*** in the ***Print*** field. Press [ENTER] to display the pull-down menu, as Figure 7-110 shows.

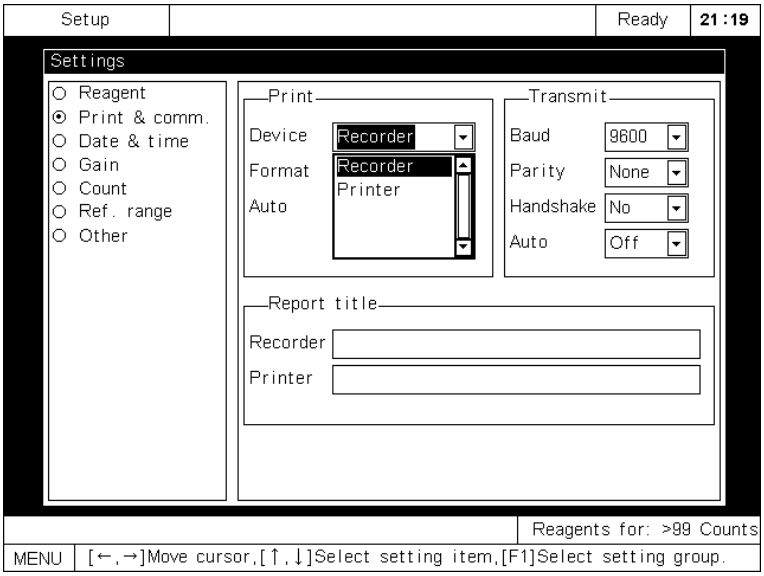


Figure 7-10 Selecting printing device

- Press [↑] or [↓] to move the cursor to ***Recorder*** or ***Printer***, and press [ENTER] to confirm the selection.
- When you are done selecting the printing device, press [↑] or [↓] to move the cursor to other printing settings you want to change.

2. Setting printing format

The printing format determines the format in which the printed contents appear in the printout. Follow the steps given below to select the printing format.

- At the Setup screen, press [F1] to select the Print & comm. group.
- Press [↑] or [↓] to move the cursor to the edit box right of Format in the Print field. Press [ENTER] to display the pull-down menu, as Figure 7-11 shows.

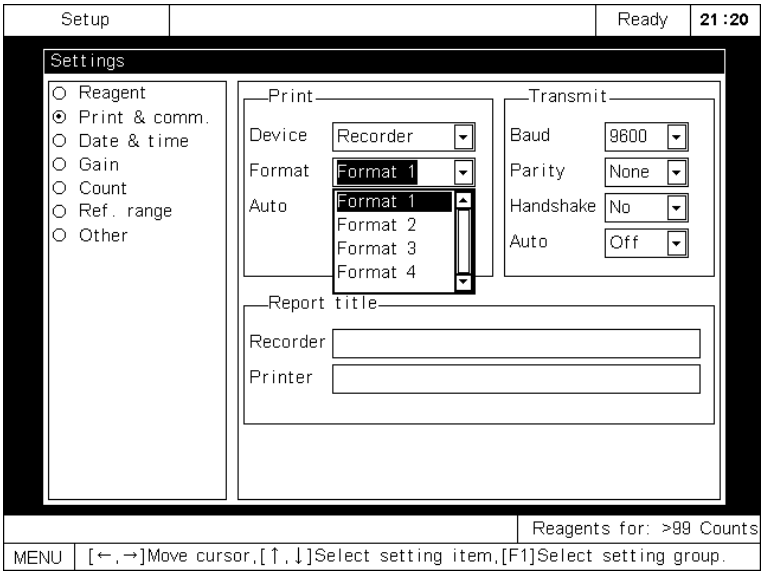


Figure 7-11 Selecting printing format

- Press [↑] or [↓] to select ***Format 1, Format2, Format3,*** or ***Format4***. Press [ENTER] to confirm the selection.
- See Table 7-2 for the definition of the four formats.

Table 7-2 Printing Formats

Printing Device	Format1	Format2	Format3	Format4
Recorder	Parameters + histograms	Parameters	Parameters+ histograms	Parameters
Printer	Whole page with histograms	Whole page without histograms	Whole page with histograms	Whole page without histograms

3. Auto Printing

The auto printing function refers to the analyzer's ability to automatically print out the analysis results once it is done. Follow the steps given below to enable or disable this function.

- At the ***Setup*** screen, press [F1] to select the ***Print & comm. group***.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Auto*** in the ***Print*** field. Press [ENTER] to display the pull-down menu, as Figure 7-13 shows.

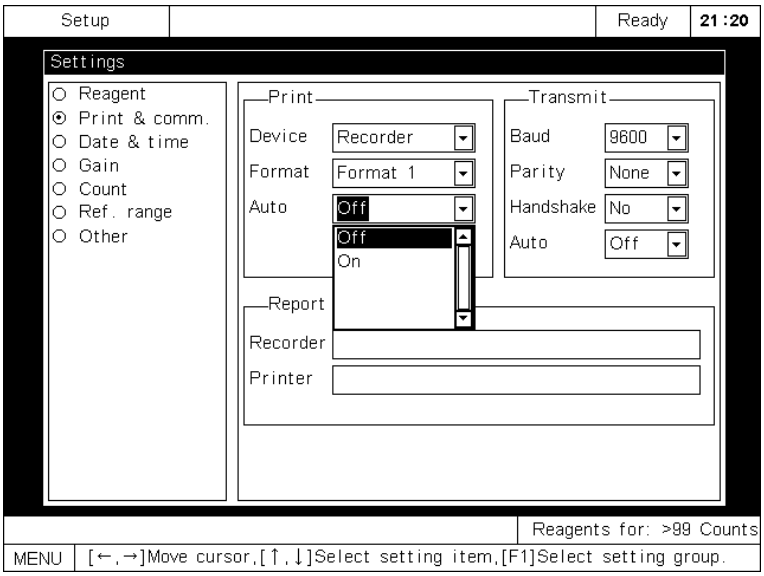


Figure 7-13 Auto printing

- Press [↑] or [↓] to move the cursor to ***On*** or ***Off***, and press [ENTER] to confirm the selection.
- When you are done enabling or disabling the auto printing function, press [↑] or [↓] to move the cursor to other printing settings you want to change.

7.2.2.2 Changing Communication Settings

You can change the communication settings to facilitate the data transmission from your analyzer to an external computer.

1. Setting Baud Rate

You may choose one of the four Baud rates for your analyzer, 9600, 4800, 2400,or 1200. The 9600 is the most common setting. Follow the steps given below to do so.

- At the Setup screen, press [F1] to select the ***Print & comm***. group.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Baud*** in the ***Transmit*** field. Press [ENTER] to display the pull-down menu, as Figure 7-14shows.

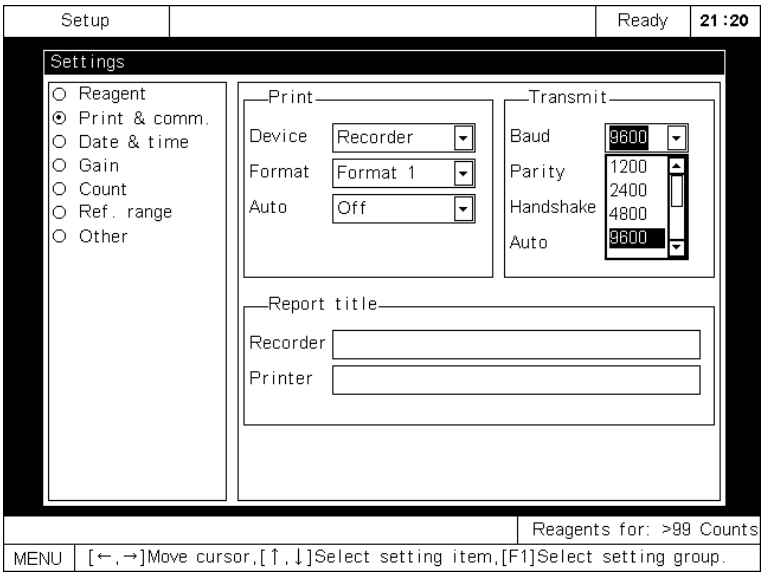


Figure 7-14 Selecting Baud rate

- Press [↑] or [↓] to move the cursor to ***9600*** and press [ENTER] to confirm the selection.
- When you are done selecting the printing device, press [↑] or [↓] to move the cursor to other printing settings you want to change.

2. Setting parity

You choose to check the odd bits, even bits or no check (default setting). Follow the steps given below to do so.

- At the ***Setup*** screen, press [F1] to select the ***Print & comm***. group.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Parity*** in the ***Transmit*** field. Press [ENTER] to display the pull-down menu, as Figure 7-15shows.

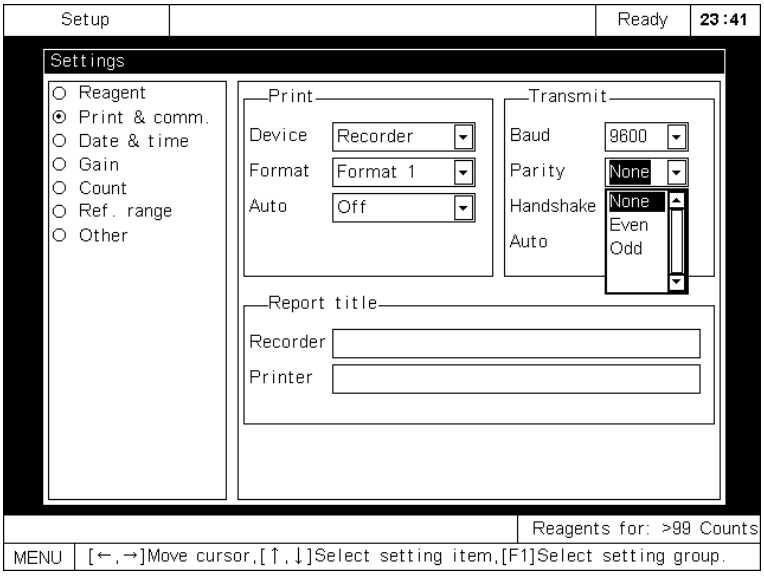


Figure 7-15 Setting parity

- Press [↑] or [↓] to move the cursor to Odd, Even or None and press [ENTER] to

confirm the selection.

- When you are done setting the parity check, press [↑] or [↓] to move the cursor to other printing settings you want to change.

3. Enabling or disabling Handshake

If the Handshake function is enabled, this analyzer send a handshake signal to the external computer that the data is to be sent to and waits for the response. If the computer does not respond, this analyzer aborts the transmission and gives an alarm for the transmission error. If the Handshake function is disabled, this analyzer transmits the data to the external computer regardless of the response. This function is disabled by default. Follow the steps given below to enable or disable it.

- At the Setup screen, press [F1] to select the ***Print & comm. group***.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Handshake*** in the ***Transmit*** field. Press [ENTER] to display the pull-down menu, as Figure 7-16shows.

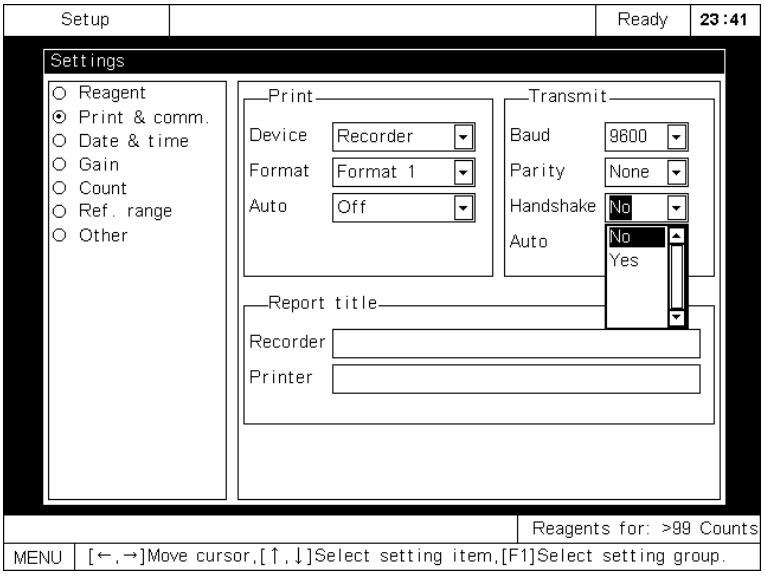


Figure 7-16 Setting handshake

- Press [↑] or [↓] to move the cursor to **On** or ***Off*** to enable or disable the handshake and press [ENTER] to confirm the selection.
- When you are done enabling or disabling the handshake, press [↑] or [↓] to move the cursor to other printing settings you want to change.

4. Auto transmission

- If the auto transmission is on, this analyzer will automatically transmit the analysis result to an external computer when the sample analysis is done. If this function is off, you have to transmit the analysis results manually. Follow the steps given below to enable or disable the auto transmission.
- At the ***Setup*** screen, press [F1] to select the ***Print & comm. group.***
- Press [↑] or [↓] to move the cursor to the combo box right of ***Auto*** in the ***Transmit*** field. Press [ENTER] to display the pull-down menu, as Figure 7-17shows.

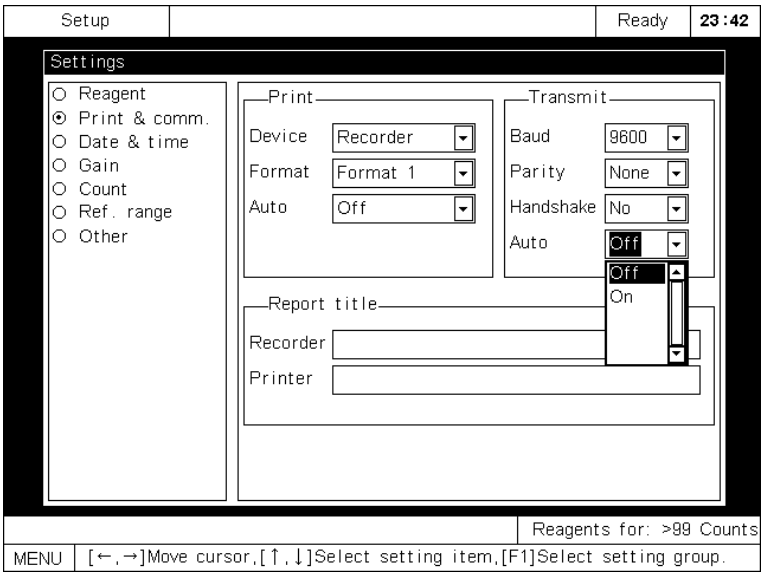


Figure 7-17 Auto transmission

- Press [↑] or [↓] to move the cursor to ***On*** or ***Off*** to enable or disable the function and press [ENTER] to confirm the selection.
- When you are done enabling or disabling the auto transmission, press [↑] or [↓] to move the cursor to other printing settings you want to change.

7.2.2.3 Changing report titles (external keyboard needed)

You can set the tiles of the reports to be printed out by the recorder or external printer. Follow the steps below to do so.

1. At the ***Setup*** screen, press [F1] to select the ***Print & comm. group***.

2. Press [↑] or [↓] to move the cursor to the edit box right of ***Recorder*** or ***Printer*** in the ***Report*** title field.

3. Press [→] or [←] to move the cursor within the edit box. Use an external keyboard to enter a letter or character at the position where the cursor is located. Press [DEL] if you want to delete the character before the cursor. Press [Backspace](on the external keyboard), if you want to delete the character after the cursor.

4. When you are done entering the report tile, press [↑] or [↓] to move the cursor to other settings you want to change.

7.2.2.4 Exiting

When you are done changing all the printing and transmission settings you want to change, you may

- press [F1] to select other setting group you want to change, or
- press [MENU] and a dialog box will pop up to remind you to save the changes, as Figure 7-18 shows. Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to save the changes and exit to the system menu or move the cursor to ***No*** and press [ENTER] to exit to the system menu without saving the changes.

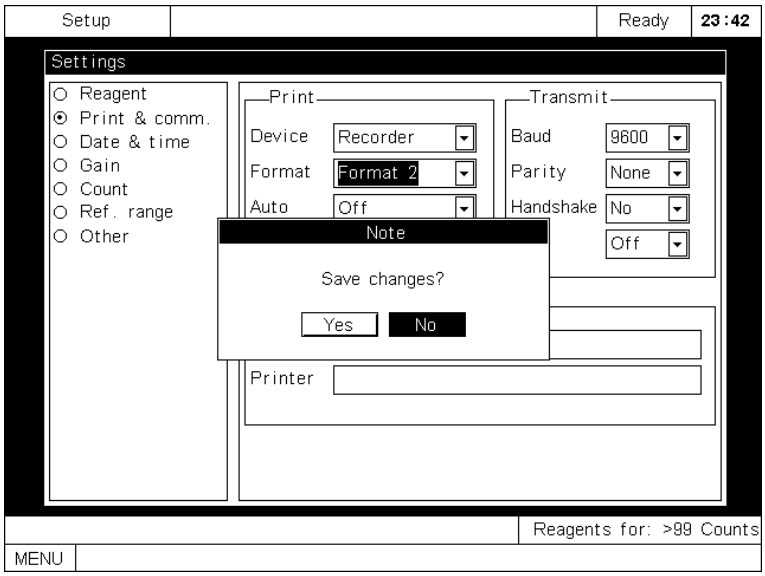


Figure 7-18 Saving changes

7.2.3 **Date and Time**

You can set the system date and time, as Figure 7-19 shows. Follow the instructions given below to do so.

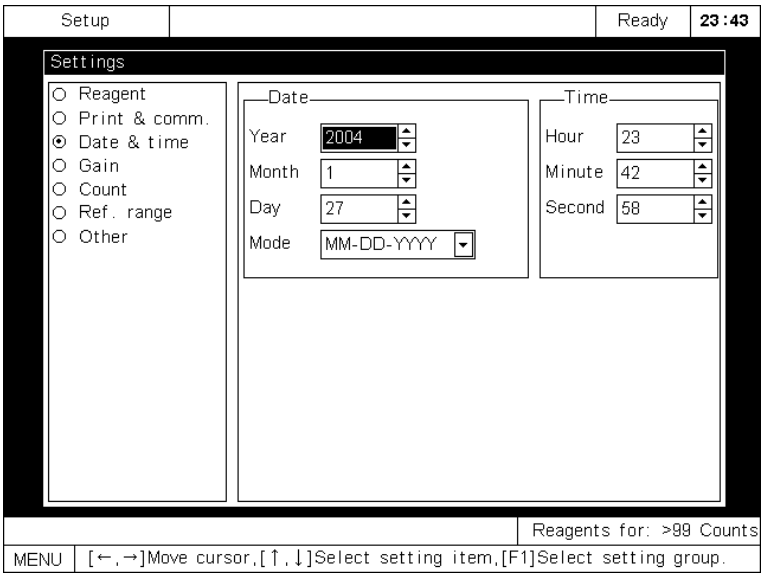


Figure 7-19 Setting date and time

7.2.3.1 Setting date

Follow the steps given below to set the system date

- At the ***Setup*** screen, press [F1] to select the ***Date& Time*** group.
- Press [↑] or [↓] to move the cursor to the edit box right of ***Year***, ***Month*** or **Day** in the ***Date*** field.
- Press [PgUp] or [PgDn] to enter the desired date.

- When you are done entering the date, press [↑] or [↓] to move the cursor to other settings you want to change.

7.2.3.2 Setting date format

You may choose one of the three date formats ***YYYY-MM-DD***, ***MM-DD-YYYY*** or ***DD-MM-YYYY***. Follow the steps given below to do so.

- At the ***Setup*** screen, press [F1] to select the ***Date& Time*** group.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Format*** in the ***Date*** field. Press [ENTER] to display the pull-down menu, as Figure 7-20 shows.
-

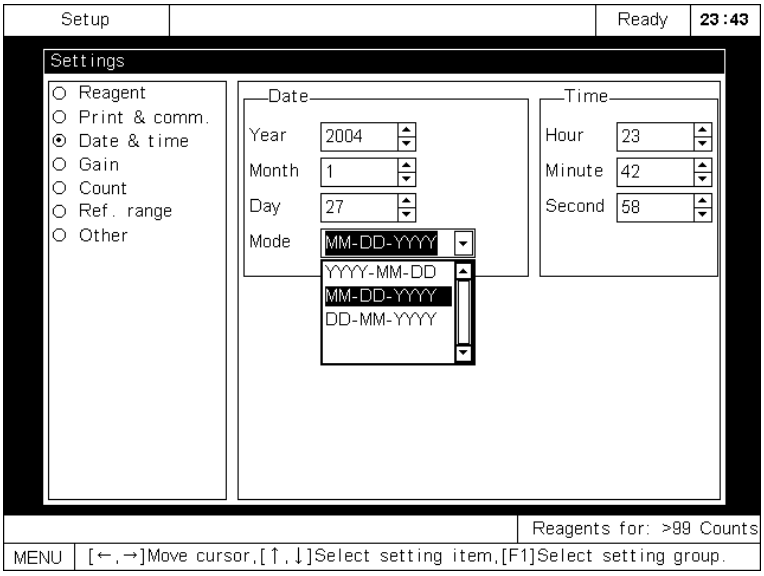


Figure 7-20 Setting date format

- Press [↑] or [↓] to move the cursor to YYYY-MM-DD, MM-DD-YYYY or DD-MM-YYYY and press [ENTER] to confirm the selection.
- When you are done enabling or disabling the auto transmission, press [↑] or [↓] to move the cursor to other settings you want to change.

7.2.3.3 Setting time

Follow the steps given below to enter the system time.

- At the ***Setup*** screen, press [F1] to select the ***Date& Time*** group.
- Press [↑] or [↓] to move the cursor to the edit box right of ***Hour, minute*** or *second* in the ***Time*** field.
- Press [PgUp] or [PgDn] to enter the desired time.
- When you are done entering the system time, press [↑] or [↓] to move the cursor to other settings you want to change.

7.2.3.4 Exiting setting date and time

When you are done changing all the printing and transmission settings you want to change,

you may

- press [F1] to select other setting group you want to change, or
- press [MENU] and a dialog box will pop up to remind you to save the changes, as Figure 21 shows. Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to save the changes and exit to the system menu or move the cursor to ***No*** and press [ENTER] to exit to the system menu without saving the changes.

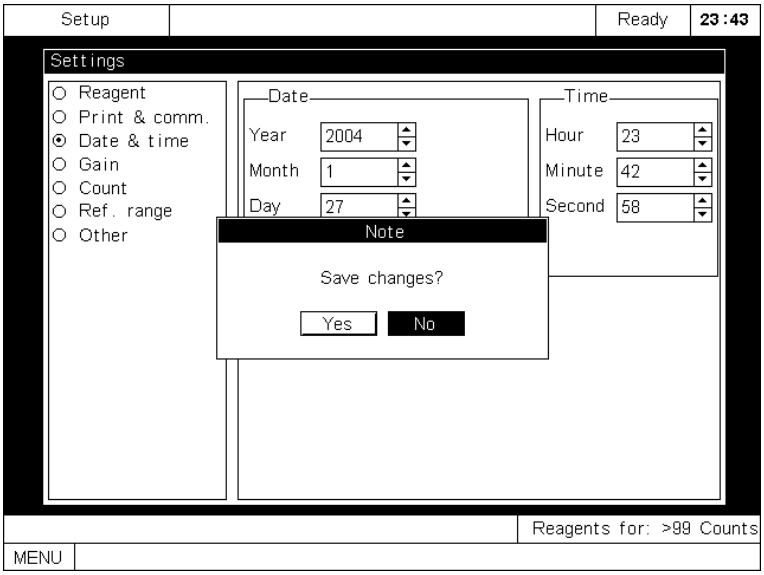


Figure 7-21 Saving changes

7.2.4 Gain

At the ***Setup*** screen, press [F1] to select the ***Gain*** group, as Figure 7-22 shows. At this screen, the gains of WBC (WB), WBC (PB), RBC or HGB are visible to all users but changeable only to the administrators.

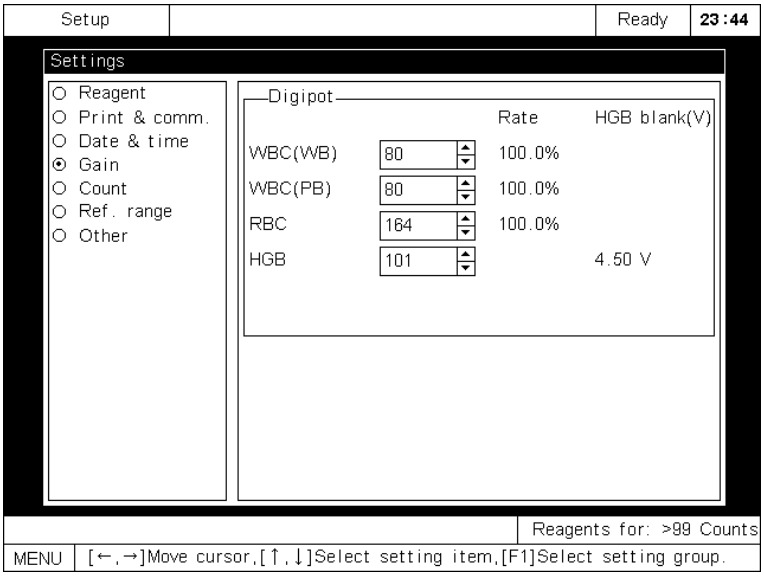


Figure 7-22Setting gain

7.2.4.1 Setting WBC gain

You may set the WBC gain to adjust the shape of the WBC histograms.

When the WBC histograms of most samples are similar to the one shown in Figure 7-23, it implies a too small WBC gain that should be increased.

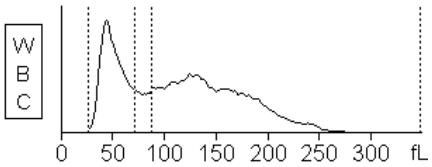


Figure 7-23 Too small WBC gain

When the WBC histograms of most samples are similar to the one shown in Figure 7-24, it implies a too large WBC gain that should be decreased.

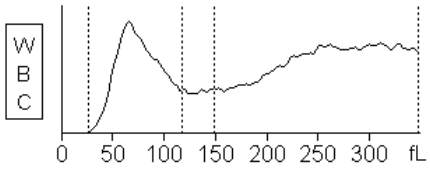


Figure 7-24 Too large WBC gain

Follow the steps given below to set the WBC gain.

- Obtain the administrator authority as instructed in **Chapter7.1.1**.
- At the ***Setup*** screen, press [F1] to select the ***Gain*** group.
- Press [↑] or [↓] to move the cursor to the edit box right of ***WBC(WB***) or ***WBC(PB)*** in the ***Gain*** field.
- Press []PgUp] or [PgDn] to enter the desired gain.
- When you are done entering the gain, press[↑] or [↓] to move the cursor to other settings you want to change.

7.2.4.2 Setting RBC gain

When the difference between the actual MCV analysis result and the expected result exceeds 6%, you need to change the RBC gain.

For example, assuming the expected MCV result is 90.0fL, while the actual analysis result is 82.0fL, then

$$\frac{ExpectedMCV}{ActualMCV}=\frac{90.0}{82.0}=1.098$$

You should adjust the RBC gain to 109.8 as close as possible. Follow the steps given below to do so.

- Obtain the administrator authority as instructed by **Chapter** 7.1.1.
- At the ***Setu***p screen, press [F1] to select the ***Gain*** group.
- Press [↑] or [↓] to move the cursor to the edit box right of ***RBC*** in the ***Gain*** field.
- Press []PgUp] or [PgDn] to enter the desired gain.
- When you are done entering the gain, press[↑] or [↓] to move the cursor to other settings you want to change.

7.2.4.3 Setting HGB gain

You may adjust the HGB gain to change the HGB blank voltage, which usually should be set between 4.3 ~ 4.5V. Follow the steps given below to set the HGB gain.

- Obtain the administrator authority as instructed in **Chapter7.1.1.**
- At the ***Setup*** screen, press [F1] to select the **Gain** group.
- Press [↑] or [↓] to move the cursor to the edit box right of ***HGB*** in the ***Gain*** field.
- Press []PgUp] or [PgDn] to enter the desired gain and observe whether the HGB blank voltage is between 4.3 ~ 4.5V.
- When you are done entering the gain, press[↑] or [↓] to move the cursor to other settings you want to change.

7.2.4.4 Exiting setting gains

When you are done changing all the printing and transmission settings you want to change, you may

- press [F1] to select other setting group you want to change, or
- press [MENU] and a dialog box will pop up to remind you to save the changes, as Figure 7-26 shows. Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to save the changes and exit to the system menu or move the cursor to ***No*** and press [ENTER] to exit to the system menu without saving the changes.

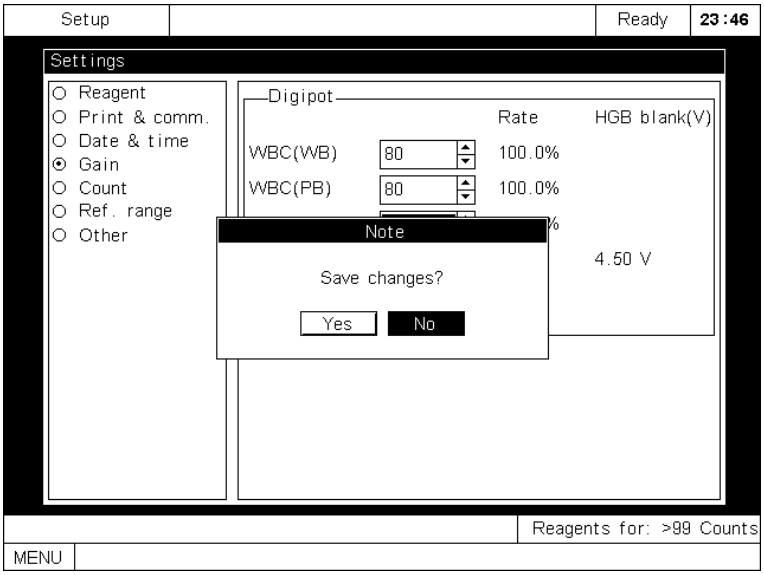


Figure 7-26 Saving changes

7.2.5 **Count**

The parameter units and count time are visible to all users but changeable only to the administrators. See Figure 7-27.You may follow the instructions given below to view or change those settings.

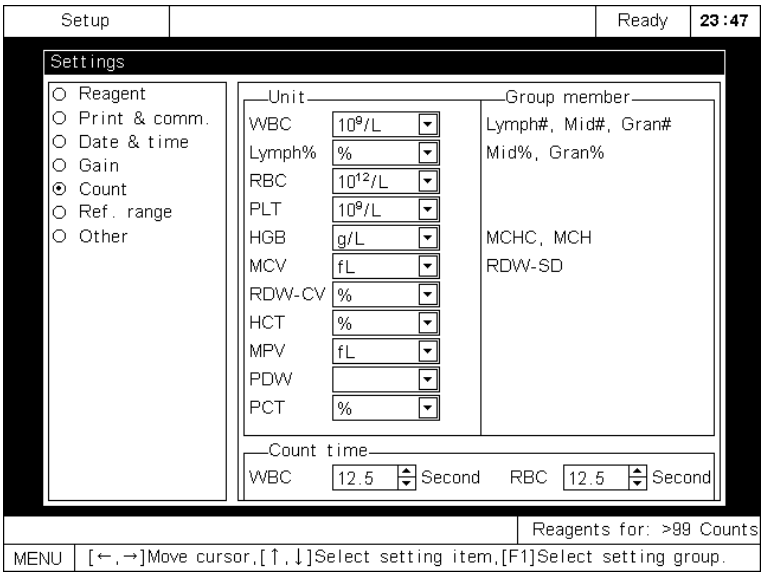


Figure 7-27 Setting units and count time

7.2.5.1 Setting parameter units

This analyzer provides multiple units for certain parameters. Refer to Table 7-3 for all the selectable units for all parameters. The 19 parameters are divided into 11 groups based on their units and you can only select unit for the first parameter of a group. Pay special attention to the HGB group, which includes HGB, MCHC and MCH. When you select g/L or g/dL as the unit of HGB, the default unit for MCH is pg and when you select mmol/L as the unit of HGB, the default unit of the MCH is fmol.

Table 7-3 Units of Parameters

Parameter	Display Format	Unit	Remarks
WBC	***.*	10^9/L	Default
Lymph#	***.*	10^3/uL	
Mid#	****	10^2/uL	
Gran#	***.*	/nL	
Lymph%	**.*	%	Default
Mid%	.***	NA	
Gran%			
HGB	***	g/L	Default
	**.*	g/dL	
	**.*	mmol/L	

RBC	*.**	10^12/L	Default
	*.**	10^6/uL	
	***	10^4/uL	
	*.**	/pL	
HCT	**.*	%	Default
	.***	L/L	
MCV	***.*	fL	Default
	***.*	um^3	
MCH	*.***	pg	Default
	.	fmol	
MCHC	****	g/L	Default
	***.*	g/dL	
	***.*	mmol/L	
RDW-CV	**.*	%	Default
RDW-SD	***.*	fL	Default
	***.*	um^3	
PLT	****	10^9 /L	Default
	****	10^3 /uL	
	***.*	10^4 /uL	
	****	/nL	
MPV	**.*	fL	Default
	**.*	um^3	
PDW	**.*	NA	Default
PCT	.***	%	Default
	*.**	mL/L	

Follow the steps given below to select the units.

- Obtain the administrator authority as instructed by **Chapter7.1.1**.
- At the ***Setup*** screen, press [F1] to select the ***Count*** group.
- Press [↑] or [↓] to move the cursor to the edit box right of the desired parameter (for instance, WBC) in the ***Count*** field. Press [ENTER] to display the pull-down menu.

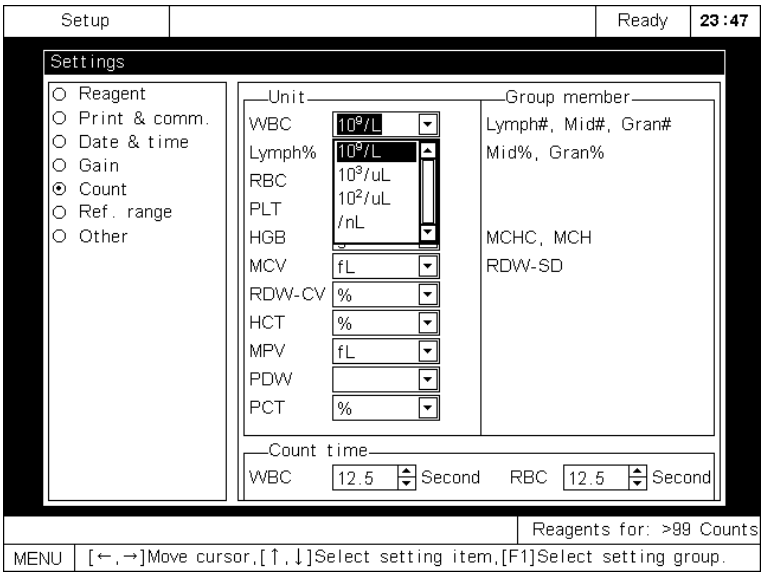


Figure 7-28 Selecting parameter unit

- Press [↑] or [↓] to move the cursor to the desired unit and press [ENTER] to confirm the selection.
- When you are done selecting units, press[↑] or [↓] to move the cursor to other settings you want to change.

7.2.5.2 Setting count time

If the WBC or RBC count time is inappropriately set, the system may give false alarms for clogs or bubbles. When this happens, follow the steps given below to change the WBC or RBC count time. Refer to the actual count time (see Chapter 8.3.1 for details) when editing the settings here.

- Obtain the administrator authority as instructed in **Chapter7.1.1.**
- At the ***Setup*** screen, press [F1] to select the ***Count*** group.
- Press [↑] or [↓] to move the cursor to the edit box right of ***WBC*** or ***RBC*** in the ***Count time*** field.
- Press []PgUp] or [PgDn] to enter the desired time.
- When you are done entering the count time, press[↑] or [↓] to move the cursor to other settings you want to change.

7.2.5.3 Exiting setting parameter units and count time

- When you are done changing all the printing and transmission settings you want to change, you may
- press [F1] to select other setting group you want to change, or
- press [MENU] and a dialog box will pop up to remind you to save the changes, as Figure 7-29 shows. Press [←] or [→] to move the cursor to ***Yes*** and press [ENTER] to save the changes and exit to the system menu or move the cursor to ***No*** and press [ENTER] to exit to the system menu without saving the changes.

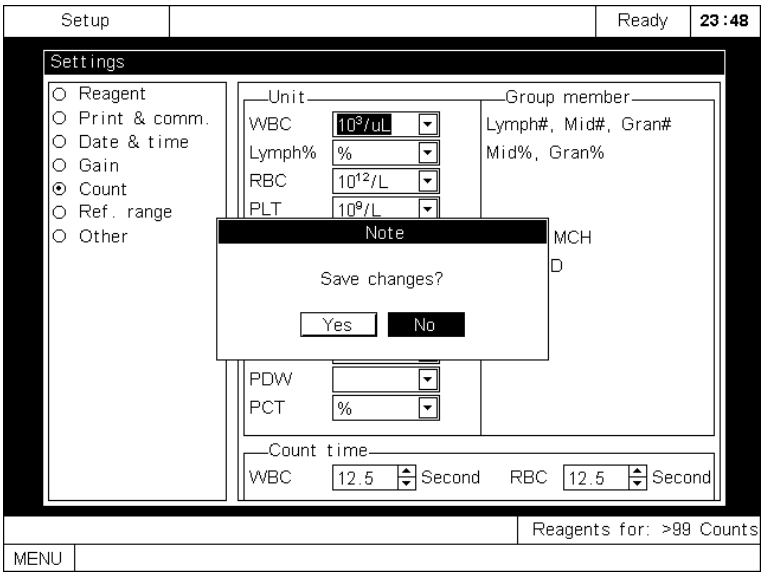


Figure 7-29 Saving changes

7.2.6 **Reference Range**

You can set a reference range for every parameter. The system will flag any analysis result that exceeds this range with either an H or L. This analyzer divides the patients into 5 patient groups, which are all listed in Table 7-4.

Table 7-4 Patient groups

Patient Group	Sex	Age
General	Not specified	Not specified
	Not specified	> 13 years
Male adults	Man	> 13 years
Female adults	Woman	> 13 years
Pediatric patients	Not specified	>= 1 month and <= 13 years
Neonates	Not specified	<1 month

The upper and lower limits of the reference ranges are visible to all users but changeable only to administrators, as Figure 7-30 shows. Follow the instructions below to set the limits.

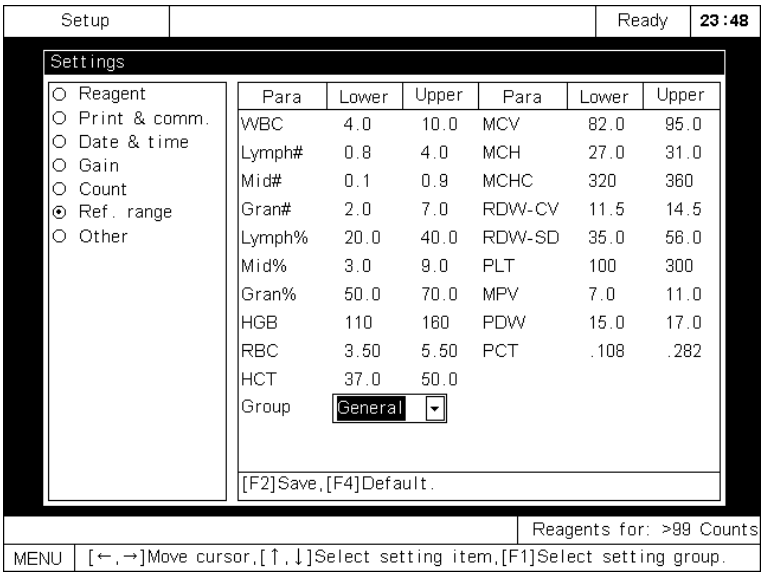


Figure 7-30 Setting reference range

7.2.6.1 Selecting patient group

Follow the steps given below to select the patient group you want.

- At the ***Setup*** screen, press [F1] to select the ***Ref. range*** group.
- Press [↑] or [↓] to move the cursor to the combo box right of ***Group***. Press [ENTER] to display the pull-down menu, as Figure 7-31 shows.

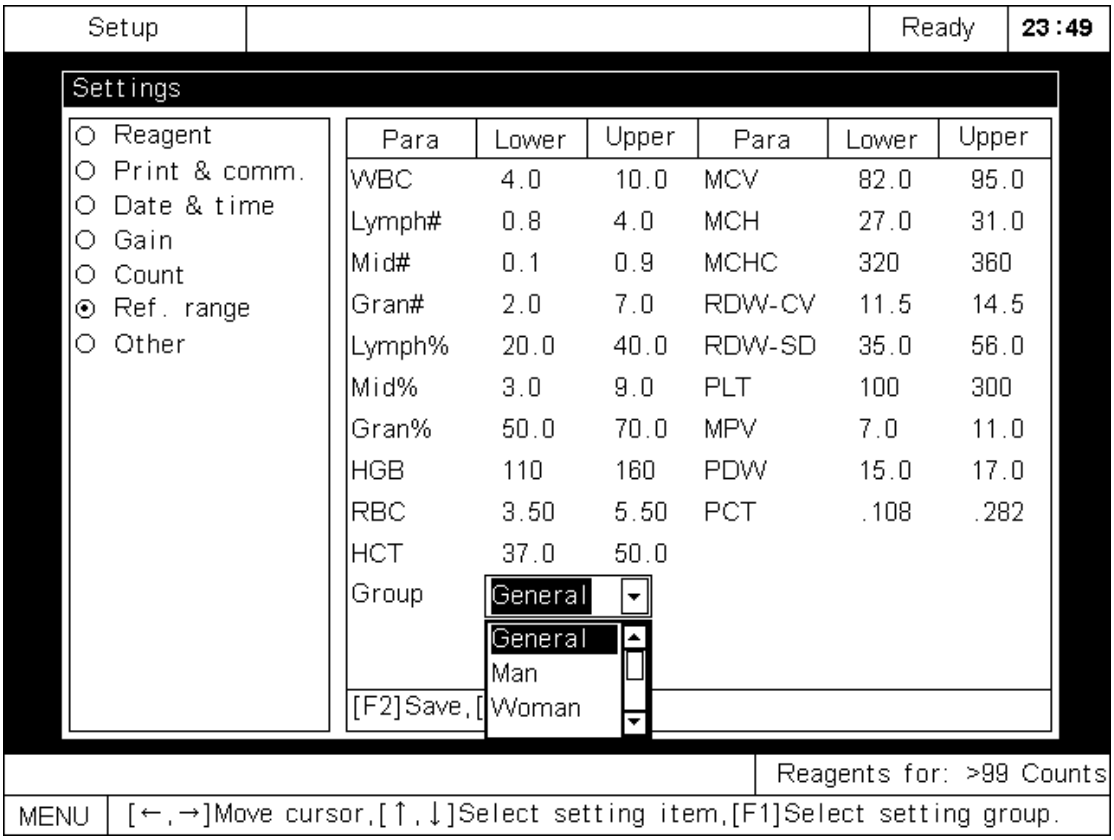


Figure 7-31 Selecting patient group

- Press [↑] or [↓] to move the cursor to ***General, Male adults, Female adults, Pediatric patients*** or ***Neonates*** and press [ENTER] to confirm the selection.
- When you are done selecting the patient group, press [↑] or [↓] to move the cursor to the parameter whose reference range you want to view or change.

7.2.6.2 Setting reference ranges(administrators only)

For the General, Male adults, Female adults and Pediatric patients groups, the manufacturer-recommended references are available for all the 19 parameters. As for the Neonates, the manufacturer-recommended references are only available for the following 5 parameters, WBC, Lymph#, RBC, HGB and PLT. You may enter or change the references to your own need. Follow the steps given below to do so.

- Obtain the administrator authority as instructed in **Chapter7.1.1**.
- At the ***Setup*** screen, press [F1] to select the ***Ref. range*** group.
- Press [↑] or [↓] to move the cursor to General, Male adults, Female adults, Pediatric patients or Neonates and press [ENTER] to confirm the selection.
- Press [↑] or [↓] to move the cursor to the upper or lower limit of the parameter (for instancet WBC) whose reference range you want to change. See Figure 7-32

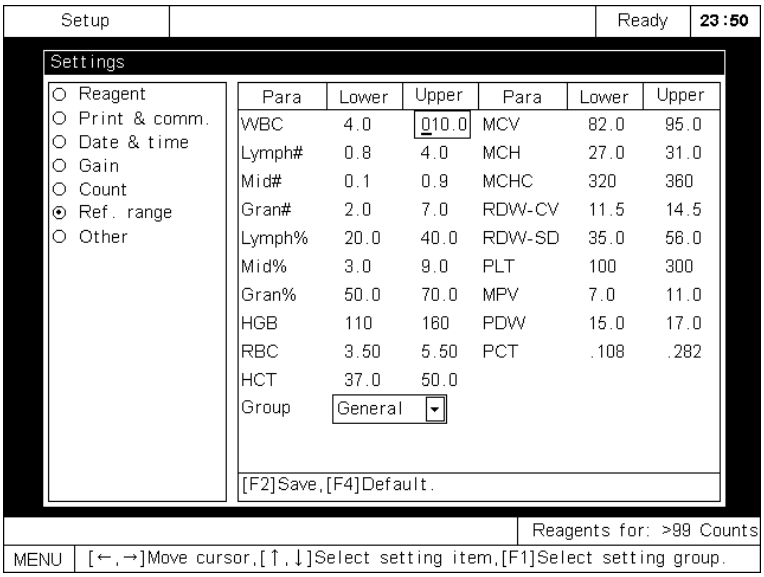


Figure 7-32 Setting upper limit for WBC

- Press [←] or [→] to move the cursor within edit box. Press [PgUp] or [PgDn] (or the numeric keys on an external keyboard) to enter a digit at the position where the cursor is located.
- Press [↑] or [↓] to move the cursor to the lower limit of the parameter (for instancet WBC) whose reference range you want to change. See Figure 7-33.

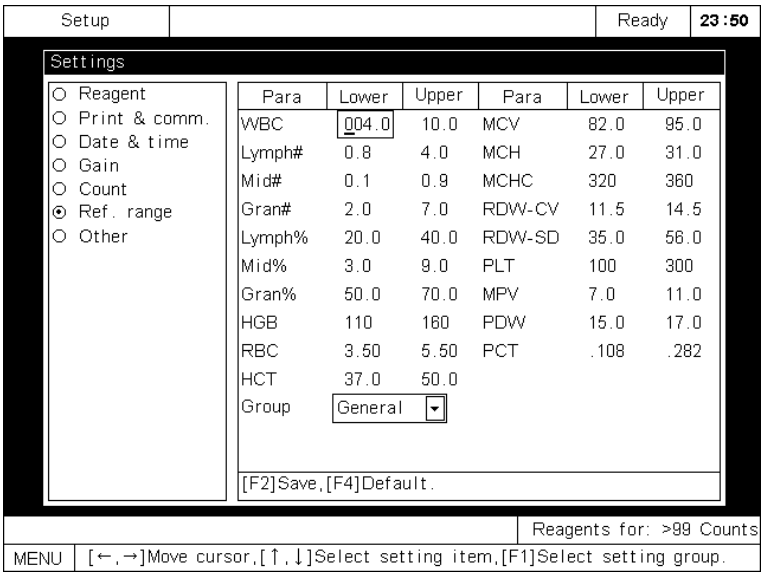


Figure 7-33 Setting lower limit for WBC

- Press [←] or [→] to move the cursor within edit box. Press [PgUp] or [PgDn] (or the numeric keys on an external keyboard) to enter a digit at the position where the cursor is located.
- When you are done setting the ranges, press [F2] to save the changes, as Figure 7-34 shows. Press [ENTER] to confirm.

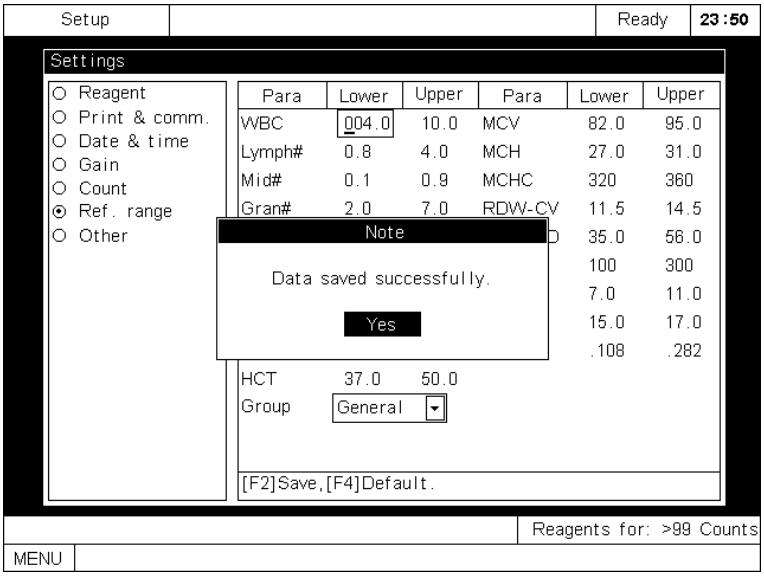


Figure 7-34 Changes saved

- If you want resume the default settings by the manufacturer, press [F4].

7.2.6.3 Exiting editing reference ranges

When you are done changing all the printing and transmission settings you want to change, you may

- press [F1] to select other setting group you want to change, or

- press [MENU] and a dialog box will pop up to remind you to save the changes. Press [←] or [→] to move the cursor to Yes and press [ENTER] to save the changes and exit to the system menu or move the cursor to No and press [ENTER] to exit to the system menu without saving the changes.

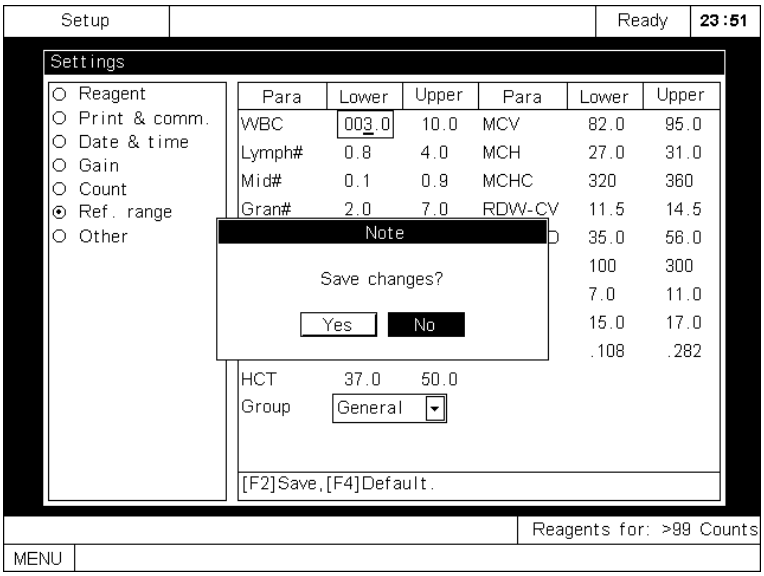


Figure 7-35 Saving changes

7.2.7 Other Settings

There are also other settings you can view or change. Follow the instructions given below to do so.

7.2.7.1 Muting beeper

This analyzer beeps when errors occur. You can mute the beeper by pressing any key or leave the beeper beeping unit the errors are removed. Follow the steps given below to do so.

- At the ***Setup*** screen, press [F1] to select the ***Other*** group.
- Press [↑] or [↓] to move the cursor to the edit box right of ***Pressing any key to mute the beeper.*** Press [ENTER] to display the pull-down menu, as Figure 7-36 shows.
- Press [↑] or [↓] to move the cursor to other settings you want to edit.

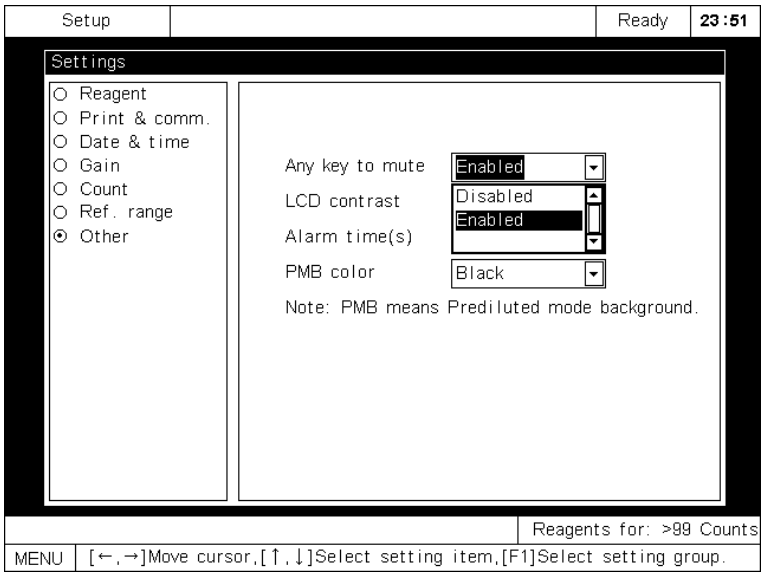


Figure 7-36 Selecting how to mute the beeper

7.2.7.2 Setting LCD contrast

Follow the steps given below to adjust the LCD contrast.

- At the ***Setup*** screen, press [F1] to select the ***Other*** group.
- Press [↑] or [↓] to move the cursor to ***LCD contrast***, as Figure 7-37 shows.

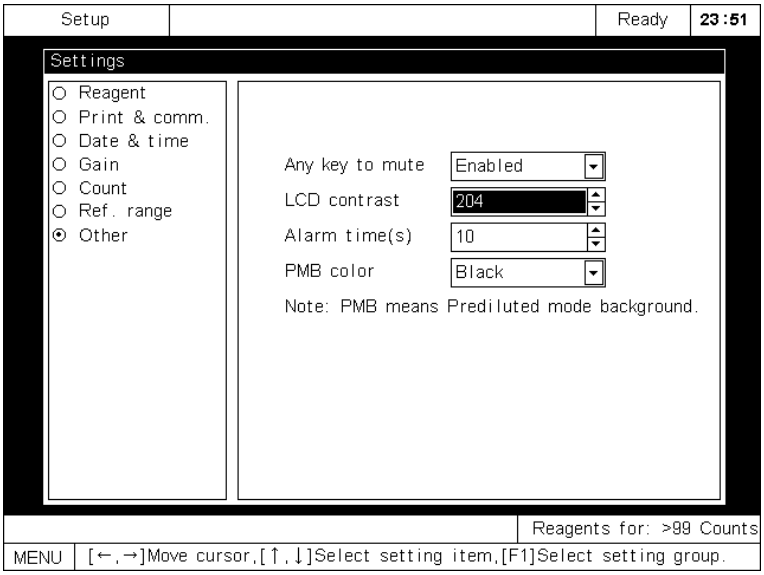


Figure 7-37 Setting LCD contrast

- Press [PgUp] or [PgDn] to adjust the contrast.
- When you are done adjusting the contrast, press [↑] or [↓] to move the cursor to other settings you want edit.

7.2.7.3 Setting alarm time

Follow the steps given below to set how long the error messages should be displayed on the screen (2s～120s).

- At the ***Setup*** screen, press [F1] to select the ***Other*** group.
- Press [↑] or [↓] to move the cursor to ***Alarm time,*** as Figure 7-38 shows.

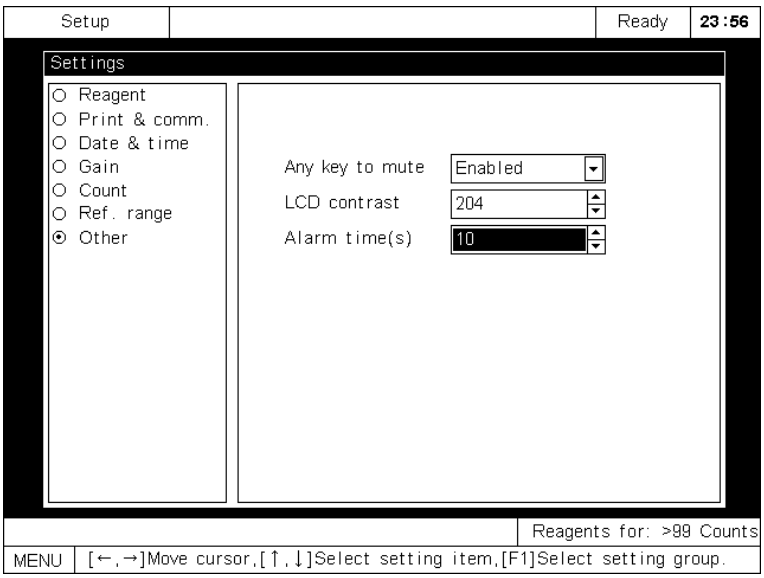


Figure 7-12 Setting alarm time

- Press [PgUp] or [PgDn] to adjust the time.
- When you are done adjusting the time press [↑] or [↓] to move the cursor to other settings you want edit.

7.2.7.4 Setting PBM color(administrator authority needed)

- Follow the steps below to set the background color of the Count screen when it is in the prediluted mode
- Obtain the administrator authority as instructed in **Chapter7.1.1**.
- At the ***Setup*** screen, press [F1] to select the ***Other*** group.
- Press [↑] or [↓] to move the cursor to ***PBM color***, as Figure 7-39 shows.

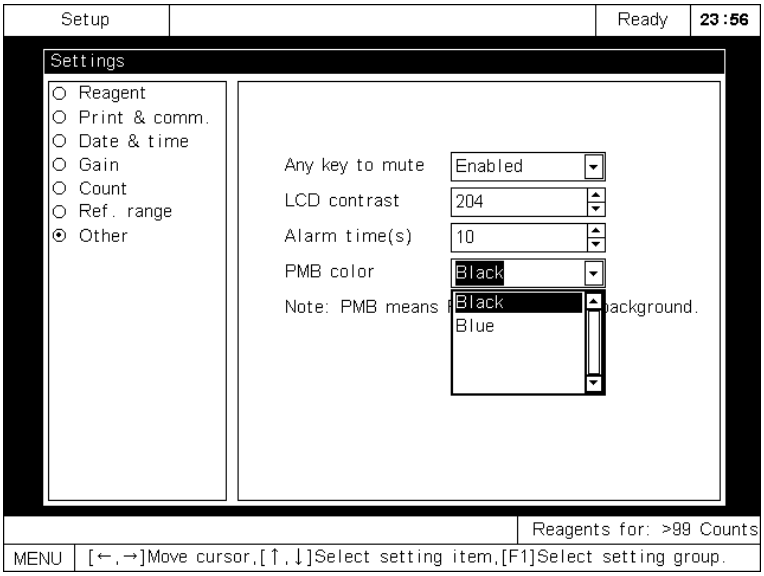


Figure 7-39 Setting PBM color

- Press [↑] or [↓] to select ***Black*** or ***Blue*** and press [ENTER] to confirm the selection.
- Press [↑] or [↓] to move the cursor to other settings you want to change.

7.2.7.5 Exiting editing other settings

When you are done changing all the printing and transmission settings you want to change, you may

- press [F1] to select other setting group you want to change, or
- press [MENU] and a dialog box will pop up to remind you to save the changes, as Figure 40 shows. Press [←] or [→] to move the cursor to Yes and press [ENTER] to save the changes and exit to the system menu or move the cursor to No and press [ENTER] to exit to the system menu without saving the changes.

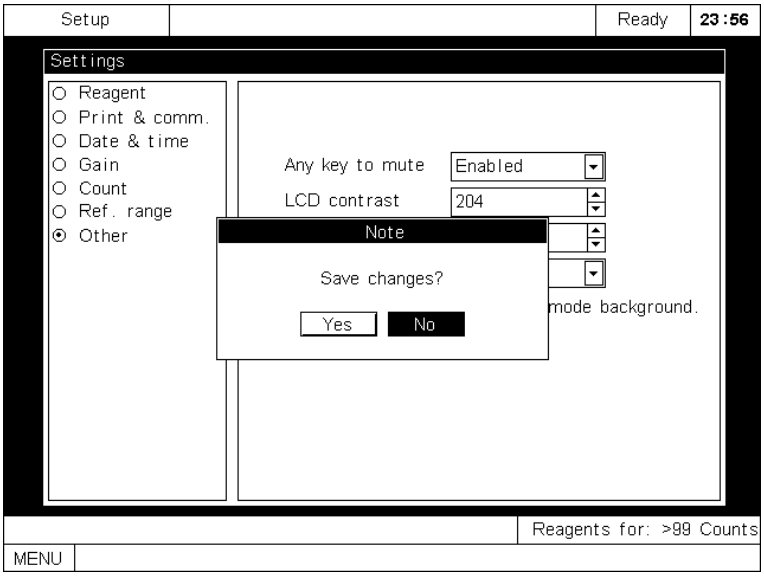


Figure 7-40 Saving changes

Chapter 8 Maintenance

Regular cleaning and maintenance are demanded to guarantee this analyzer operating properly. This chapter introduces how to take care of this analyzer and check the system status.

Liquid overflow or leak during the operation of this analyzer will degrade the accuracy of the analysis results. Once it occurs, immediately wipe off the spills. If it occurs inside this analyzer, be sure to shut down the power immediately and call Mindray Customer Services Department or the distributor. Otherwise, the service life of this analyzer may be shortened.

8.1 Regular Maintenance

To keep this analyzer in a good shape, regular maintenance is demanded.

8.1.1 Special Notes

The parts in contact with blood are potentially infectious. Be sure to wear standard laboratory attire (including rubber gloves) when maintaining or operating this analyzer and wash your hands with detergent when you are done.

- Be sure to keep you hair, clothes, cuff or hands away from the moving parts of this analyzer.
- Be sure to use specified tools or parts to maintain this analyzer and be sure to clean the used tools as instructed by their instruction manual when you are done.
- Be sure to use soft and clean cloth, or neutral detergent-soaked cloth (twisted dry), or soft cloth washed by ethanol to clean the surface of this analyzer.
- Be sure to pay attention to the marks or symbols on this analyzer. Be sure not to touch the power plug at the back of this analyzer with wet hands or wet rags.
- Be sure not use organic solvent or acid/alkaline detergent to wash the surface of this analyzer. Otherwise, the surface may fade or become corrupted.
- Be sure to avoid direct contact with the reagents that will hurt your eyes, skin and diaphragm. In case you spill the reagents on you skin, be sure to wash them off with much water. In case you spill the reagents into your eyes, be sure to immediately wash your eyes with much water and go see a doctor for further treatment.

8.1.2 Recommended Regular Maintenance

Maintenance Period	Content of Maintenance
Everyday	If you are to use this analyzer 24 hours a day, be sure to perform the ***E-Z cleanser cleaning*** procedure everyday.
	Run the QC program everyday. See **Chapter 4 Quality Control** for details.
Every three days	If you are to use this analyzer 24 hours a day, be sure to perform the ***Probe cleanser cleaning*** procedure every three days.
Every Week	If you shut down your analyzer every day and follow the specified shutdown procedure to do that, you need to perform the ***Probe cleanser cleaning*** procedure every week**.**
Every Month	You should use the supplied sample probe localizer to calibrate the position of the sample probe to that of the wipe block. The analysis result is sensitive to their alignment.
As needed	When you think the bath might be dirty, perform the ***Clean the bath*** procedure.
	When the analyzed samples add up to 300, the system will remind the user to perform the ***Probe cleanser cleaning*** procedure.
	When the analyzed samples add up to 4,000, the system will remind the user to perform the ***Clean wipe block*** procedure.
	When this analyzer is not to be used for two weeks, be sure to perform the ***Prepare to ship*** procedure to empty and wash the flow system.
	To obtain reliable analysis results, this analyzer needs to work in a normal status. Be sure to run the ***Self-test*** items regularly to check the status of this analyzer.
	When this analyzer gives alarms for clogging, you can perform the ***Flush aperture*** or ***Zap aperture*** procedure, or press [F2] at the ***Count*** screen to unclog the system.
	If you see other error messages, see **Chapter 9 Troubleshooting**, for solutions.

8.2 System Maintenance

Press [MENU] to enter the system menu and press the appropriate arrow keys ([↑][↓][←][→])to move the cursor to ***Service*** → ***Maintenance***, as Figure 8-1 shows.

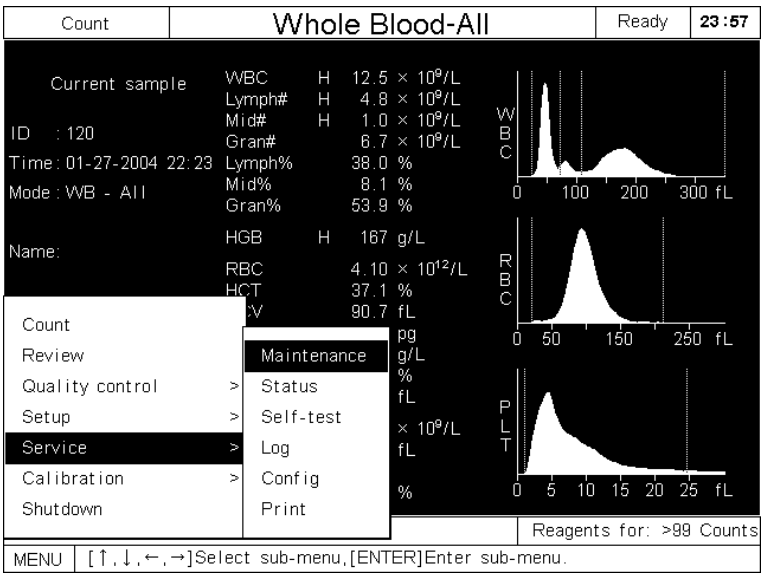


Figure 8-1 Entering maintenance screen

Press [ENTER] to enter the ***Maintenance*** screen, as Figure 8-2 shows.

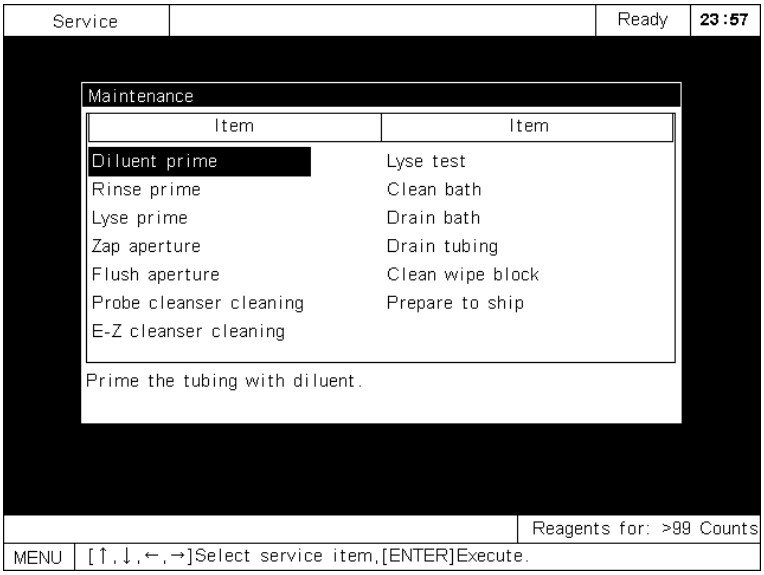


Figure 8-2 Maintenance screen

If you want to exit this screen, press [MENU] to enter the system menu and access the desired screen from there.

8.1.1 **Diluent Prime**

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

You should perform the ***Prime diluent*** procedure to prime the diluent tubing with diluent when

- there are bubbles in the tubing; or
- the diluent in the tubing is contaminated; or
- the diluent ran out and a new container of diluent is installed.

Follow the steps given below to do so

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Diluent Prime***.
- Press [ENTER] to prime the tubing with diluent and the priming progress will be displayed at the bottom of the screen, as Figure 8-3 shows.
- When the priming is done, the screen will return to the initial state.

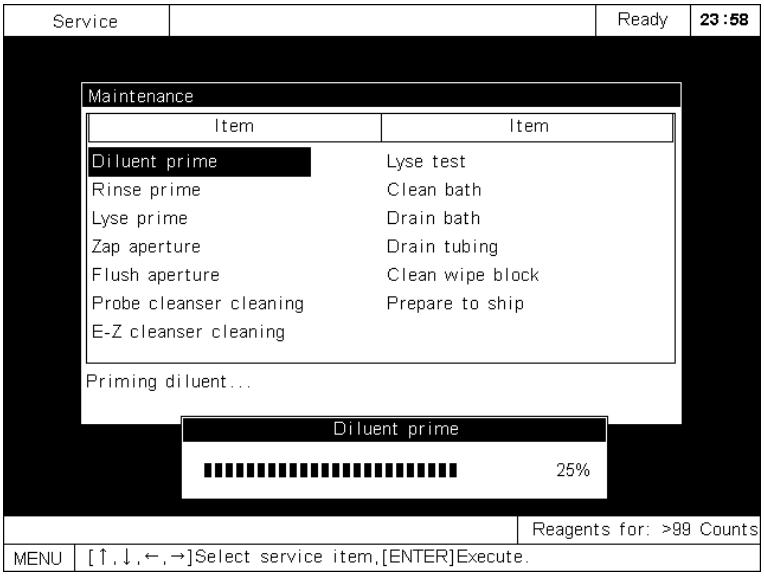


Figure 8-3 Priming tubing with diluent

8.1.2 **Rinse Prime**

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

You should perform the ***Rinse prime*** procedure to prime the rinse tubing with the rinse when

- there are bubbles in the tubing; or
- the rinse in the tubing is contaminated; or
- the old rise ran out and a new container of rinse is installed.

Follow the steps given below to do so:

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Rinse prime***.
- Press [ENTER] to prime the tubing with rinse and the priming progress will be displayed at the bottom of the screen, as Figure 8-4 shows.
- When the priming is done, the screen will return to the initial state.

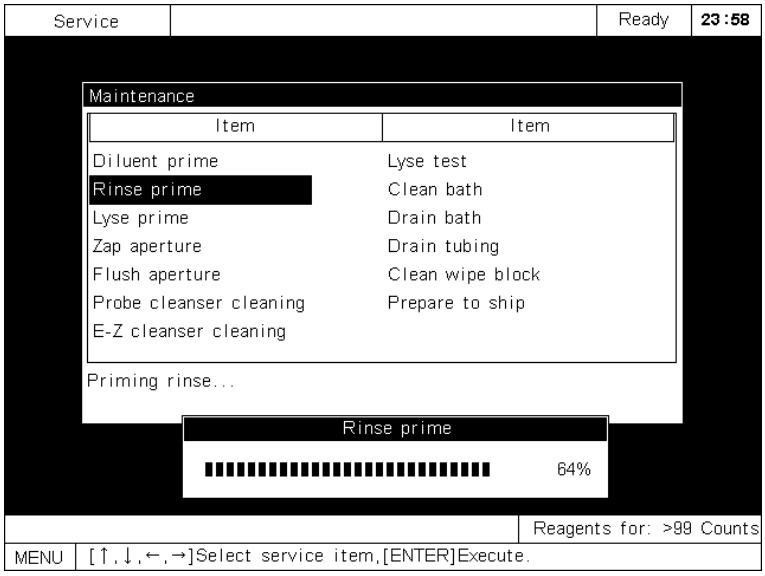


Figure 8-4 Priming tubing with rinse

8.1.3 **Lyse Prime**

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

You should perform the ***Lyse prime*** procedure to prime the lyse tubing with lyse when

- there are bubbles in the tubing; or
- the lyse in the tubing is contaminated; or
- the old lyse ran out and a new container of lyse is installed.

Follow the steps given below to do so:

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move

the cursor to ***Lyse prime.***

- Press [ENTER] to prime the tubing with lyse and the priming progress will be displayed at the bottom of the screen, as Figure 8-5 shows.
- When the priming is done, the screen will return to the initial state.

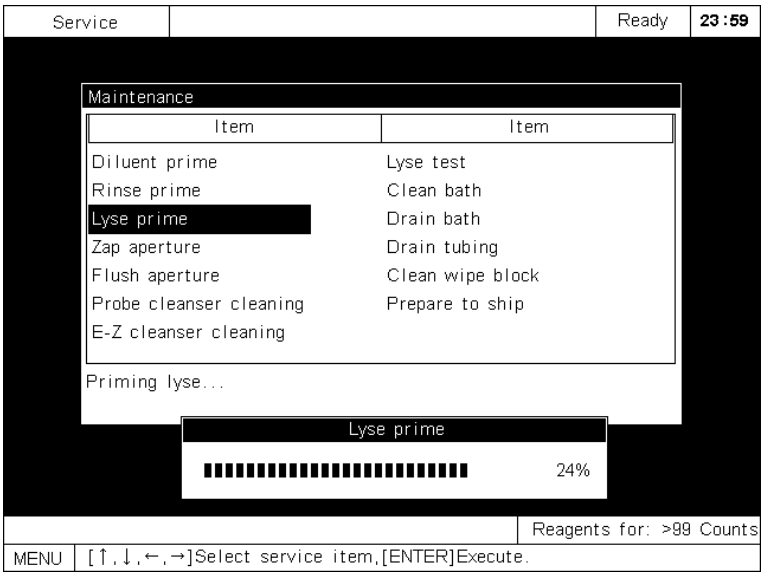


Figure 8-5 Priming tubing with lyse

8.1.4 **Zap Aperture**

You can perform the ***Zap aperture*** procedure to unclog or prevent clogging.

Follow the steps given below to do so：

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Zap aperture.***
- Press [ENTER] to zap the aperture and the zapping progress will be displayed at the bottom of the screen, as Figure 8-6 shows.
- When the zapping is done, the screen will return to the initial state.

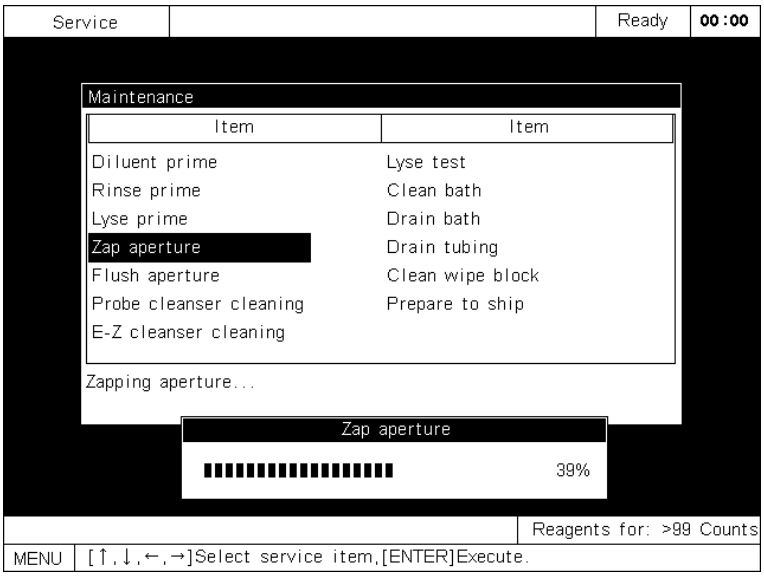


Figure 8-6 Zapping aperture

8.1.5 **Flushing Aperture**

You can perform the ***Flush aperture*** procedure to assist zapping the aperture.

Follow the steps given below to perform the procedure：

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Flush aperture***.
- Press [ENTER] to flush the aperture and the flushing progress will be displayed at the bottom of the screen, as Figure 8-7shows.
- When the flushing is done, the screen will return to the initial state.

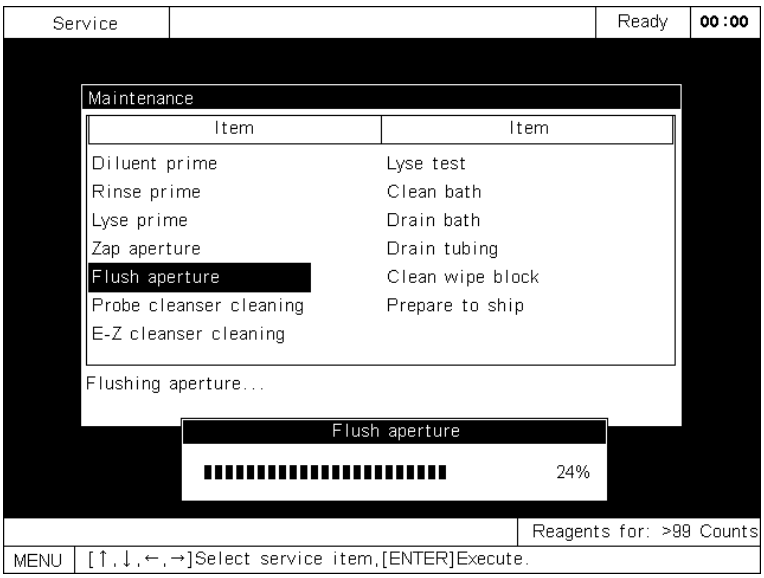


Figure 8-7 Flushing aperture

8.1.6 **Probe Cleanser Cleaning**

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

You can soak the bath and tubing with the probe cleanser, an alkaline detergent, by performing the **Probe cleanser cleaning** procedure. If your analyzer is to run 24 hours a day, you should perform this procedure every 3 days. If you follow the shutdown procedure to turn off your analyzer everyday, you should perform this procedure every week.

Follow the steps given below to do so:

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Probe cleanser cleaning***.
- Present the cleanser to the probe and press [ENTER] to aspirate the cleanser. Remove the cleanser after the probe has risen up. This analyzer will automatically soak the bath and tubing with the aspirated cleanser.
- The soaking process will last about 5 minutes and you may press [ENTER] to stop the process any time. Note that a shortened soaking process may not bring such a good result as a complete one.
- When the soaking is done, press [ENTER] to flush the bath and tubing. The screen will return to the initial state.

To make sure this analyzer functions normally, every time the accumulated analyzed samples reach 200, a dialog box will pop up to remind the user to perform the ***Probe cleanser cleaning*** procedure. If you want to do so, move the cursor to ***Yes*** and press [ENTER]; otherwise, move the cursor to ***No*** and press [ENTER].

8.1.7 **E-Z Cleanser Cleaning**

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

You can use the E-Z cleanser, an enzyme based, isotonic cleaning solution and wetting agent, to clean the tubing and bath by performing the ***E-Z cleanser cleaning*** procedure.

Follow the steps given below to perform the procedure:

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***E-Z cleanser cleaning***.
- Present the cleanser to the probe and press [ENTER] to aspirate the cleanser. Remove the cleanser after the probe has risen up. This analyzer will automatically soak the bath and tubing with the aspirated cleanser.
- The soaking process will last about 10 minutes and you may press [ENTER] to stop the process any time. Note that a shortened soaking process may not present such a good result as a complete one.
- When the soaking is done, press [ENTER] to flush the bath and tubing and the screen will return to the initial state.

If you analyzer has been running continuously for 24 hours, the dialog box will pop up to remind the user to perform the ***Probe cleanser cleaning*** procedure. If you want to do so, move the cursor to ***Yes*** and press [ENTER**]**. Otherwise, move the cursor to ***No*** and press [ENTER].

8.1.8 **Lyse Test**

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

In case of any abnormal WBC counts or histograms, you can perform the **Lyse test** procedure to check whether the lyse can be dispensed properly.

Follow the steps given below to do so:

- Unscrew and remove with hands or screwdrivers the retaining screws (pointed by the arrows shown in Figure 8-9) on the right plate.

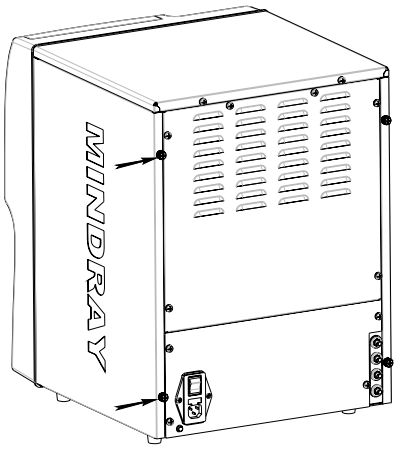


Figure 8-9 Removing the two screws

- Follow the arrow shown in Figure 8-11 to push and remove the right plate.

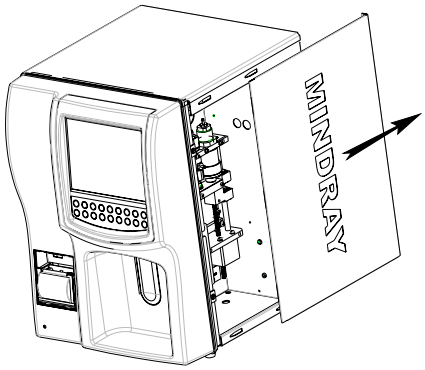


Figure 8-10 Removing right plate

- Remove the screws fixing the shielding box of the bath, as Figure 8-11 shows.

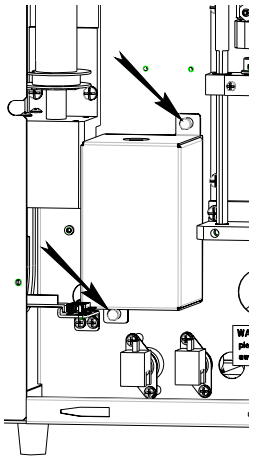


Figure 8-11 Shielding box

- Remove the shielding box to expose the bath, as Figure 8-12 shows.

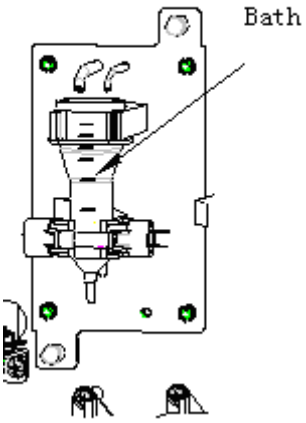


Figure 8-12 Bath

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Lyse test***
- Press [ENTER] and this analyzer will automatically drain the bath and then dispense 2ml lyse to the bath.
- Check the scale to see whether the lyse has reached the expected line(the second from bottom). In case the dispensed lyse has failed to reach this line for several consecutive times, check whether the lyse has run out or the lyse tubing is not properly connected to this analyzer. If the lyse is still enough and the tubing is well connected to the analyzer, contact the Mindray customer service department for repair.
- Press [ENTER] to flush the bath and finish the test. The screen will return to the initial state.

8.1.9 **Clean Bath**

When you keep finding abnormal results from the background check, follow the steps given below to do so:

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Clean bath***.
- Press [ENTER] to start the procedure.
- When the cleaning is done, the screen returns to the initial state.

8.1.10 **Drain Bath**

When you need to drain the bath, follow the steps given below to perform the ***Drain bath*** procedure.

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Drain bath***.
- Press [ENTER] to start the procedure.

- When the bath is drained, the screen displays Prime the bath with diluent, as Figure 8-13 shows. Press [ENTER] to continue and when the priming is done, the screen returns to the initial state.

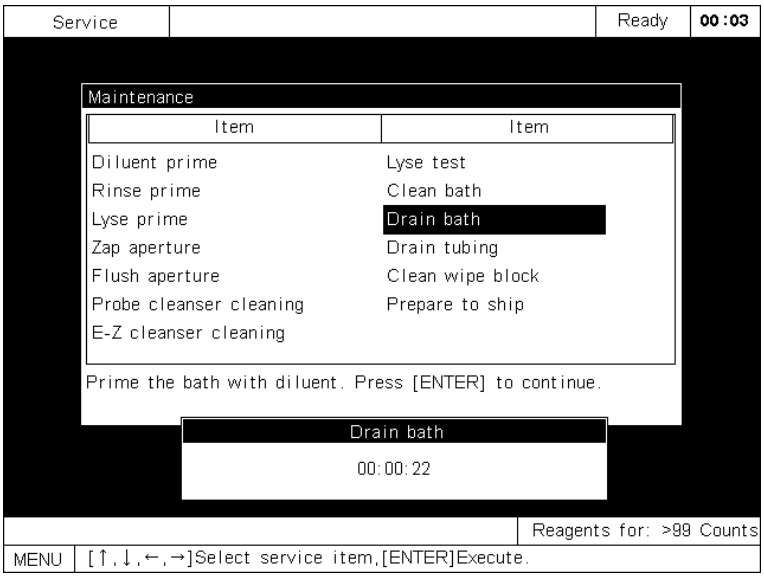


Figure 8-13 Drain Bath

8.1.11 **Draining Tubing**

If this analyzer is not to be used for a long time or it is to be maintained, be sure to perform the Drain tubing procedure.

Follow the steps given below to do so：

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→])to move the cursor to ***Drain tubing***.
- Press [ENTER] and follow the displayed instructions to remove all the tubes, except for the one for the waste, from this analyzer.
- Press [ENTER] to start the draining procedure.
- When the draining is done, the screen will display ***Turn off this analyzer*** and you should turn off this analyzer as instructed.

8.1.12 **Cleaning Probe Wipe Block**

After being used for a long time, the bottom of the probe wipe block may be contaminated by blood and the inside of the block may also be contaminated by the dirt sucked in. So you need to clean the wipe block regularly.

Follow the steps given below to do so:

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→])to move the cursor to ***Clean wipe block***.
- Present the probe cleanser to the sample probe and press [ENTER] to aspirate the

cleanser. Remove the cleanser after the probe has risen up.

- Unscrew and remove with hands or screwdrivers the retaining screws (pointed by the arrows shown in Figure 8-9) on the right plate of this analyzer.
- Follow the arrow shown in Figure 8-10 to push and remove the right plate.
- Follow the instructions displayed on the screen to place an empty cup below the sample probe.
- Press [ENTER] to soak the wipe block with the aspirated cleanser. The soaking progress will be displayed on the screen, as Figure 8-14.

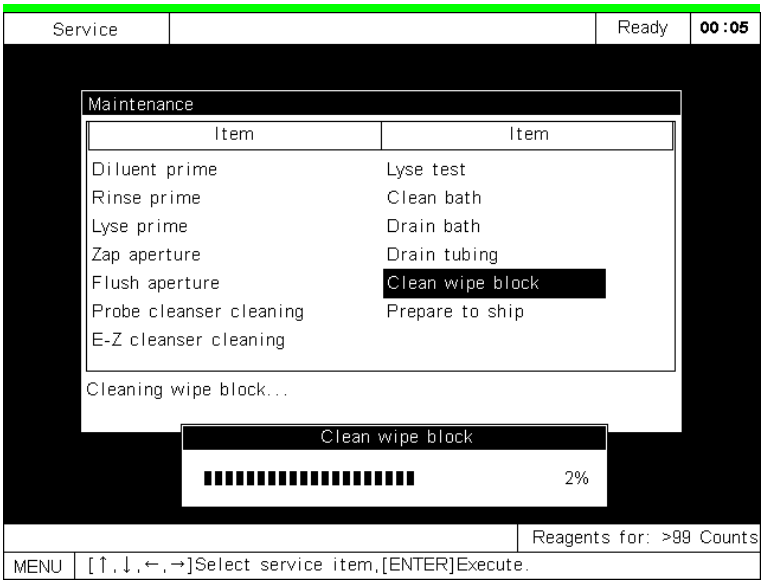


Figure8-14 Cleaning wipe block

- When the soaking is done, wipe the bottom of the wipe block with a fiber cloth that does not leave debris.
- Press [ENTER] to flush the block and the inner surface of the probe.
- After the flushing is done, the screen returns to the initial state.
- When the accumulated analyzed samples reach 4,000, a dialog box will pop up to remind the user to clean the wipe block, Figure 8-16 shows. You may move the cursor to Yes and press [ENTER] to start the cleaning, or to No and press [ENTER] to ignore the message.

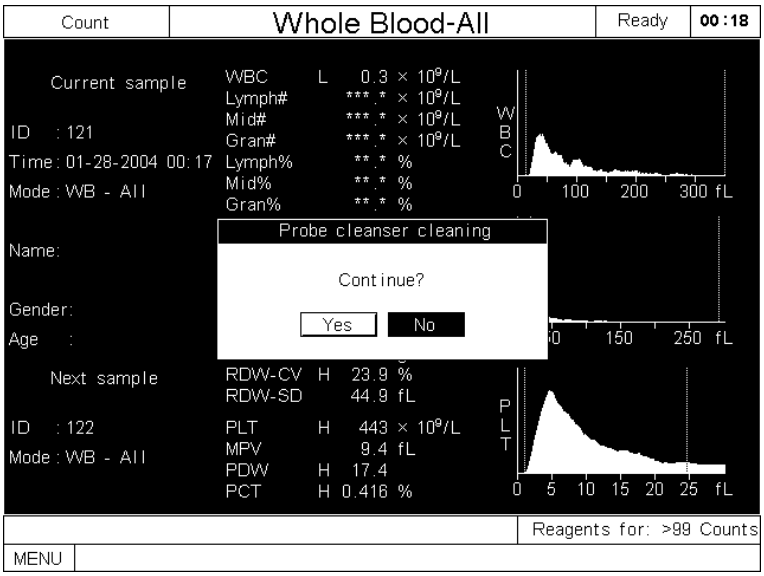


Figure 8-15 Recommending probe cleanser cleaning

8.1.13 **Preparing to Ship**

If this analyzer is not to be used for over two weeks, or is to be shipped, perform the ***Prepare to ship*** procedure to flush and drain it.

Follow the steps given below to do so：

- At the ***Maintenance*** screen, press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Prepare to ship***.
- Remove the diluent, rinse and lyse tubes from their containers.
- Press [ENTER] and a dialog box will pop up to ask you to confirm this operation, as Figure 8-16 shows

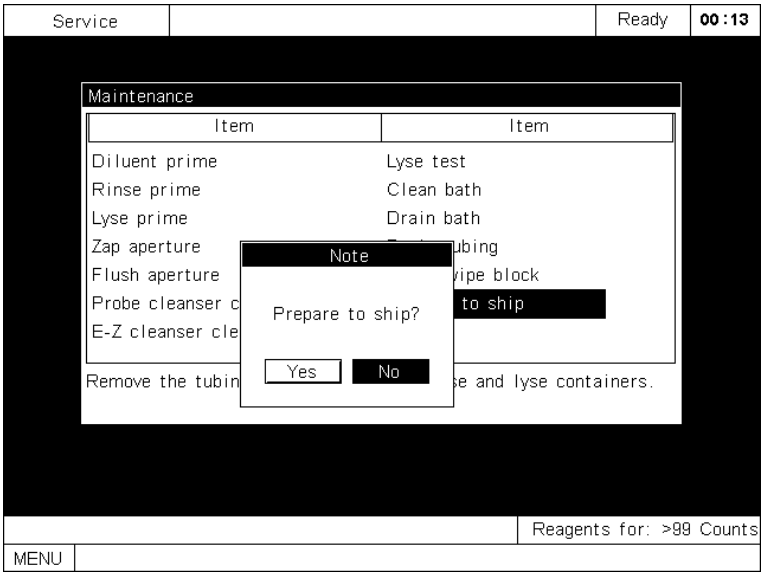


Figure 8-16 A dialog box of confirmation

- Move the cursor to ***Yes*** and press [ENTER] if you want to proceed with this procedure, or

to No and press [ENTER] if you wan to abort this operation. If there is any error present, the system will not perform this procedure. Follow the instructions displayed on the screen to remove the error before trying to perform the procedure again.

- After draining the tubing, follow the instructions displayed on the screen to put the rinse, diluent and lyse tubes into distilled water and press [ENTER] to flush this analyzer with the distilled water.
- When the washing is over, follow the instructions displayed on the screen to remove the rinse, diluent and lyse tubes from the distilled water and press [ENTER] to drain the tubing again.
- Turn off the analyzer when the screen displays ***Turn off the analyzer***.
- Wipe this analyzer dry and wrap it up for storage.

8.3 System Status

The items displayed in the ***Status*** screen reflect how the system is functioning and contribute significantly to diagnosing system errors. You may follow the instructions given below to check those items.

Press [MENU] to enter the system menu and press the appropriate arrow keys to move the cursor to ***Service*** → ***Status***, as Figure 8-17 shows.

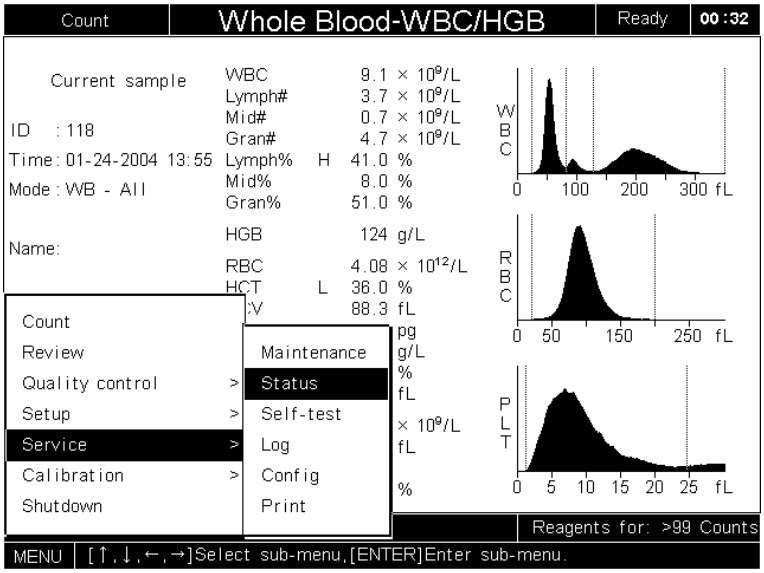


Figure 8-17 Entering status screen

Press [ENTER] to enter the Status screen, as Figure 8-18 shows.

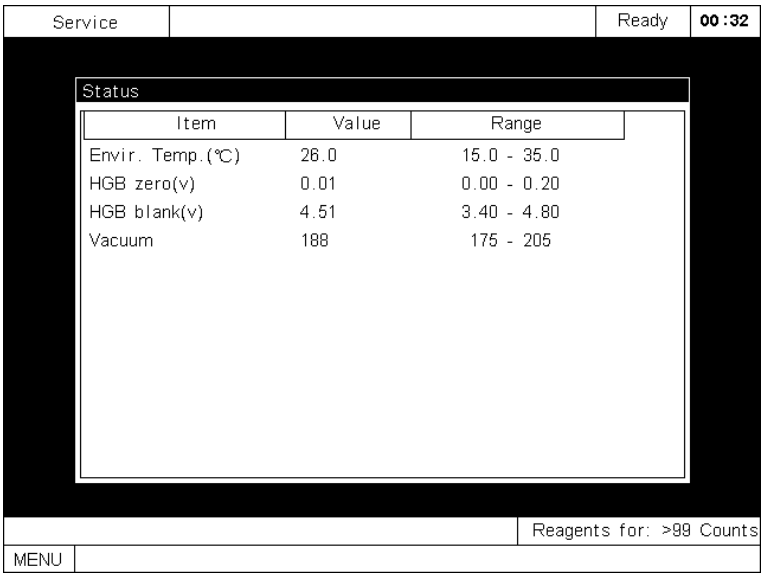


Figure 8-18 Status screen

Note that you can only view the displayed status items without changing them. If any of the displayed item exceeds the given range, see **Chapter 9 Troubleshooting** for solutions.

8.4 System Self-Test

The system self-test is a major way to locate system errors. Follow the instructions given below to view and check the available self-tests items.

Press [MENU] to enter the system menu and press the appropriate arrow keys([↑][↓][←][→])to move the cursor to ***Service → Self-test***, as Figure 8-19 shows.

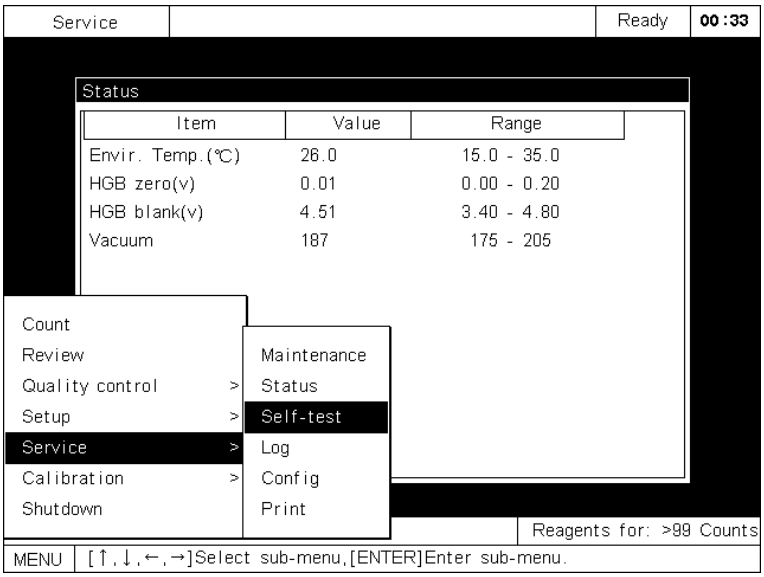


Figure 8-19 Entering self-test screen

Press [ENTER] to enter the ***Self-test*** screen, as Figure 8-20 shows. If you want acquire help information, press [HELP].

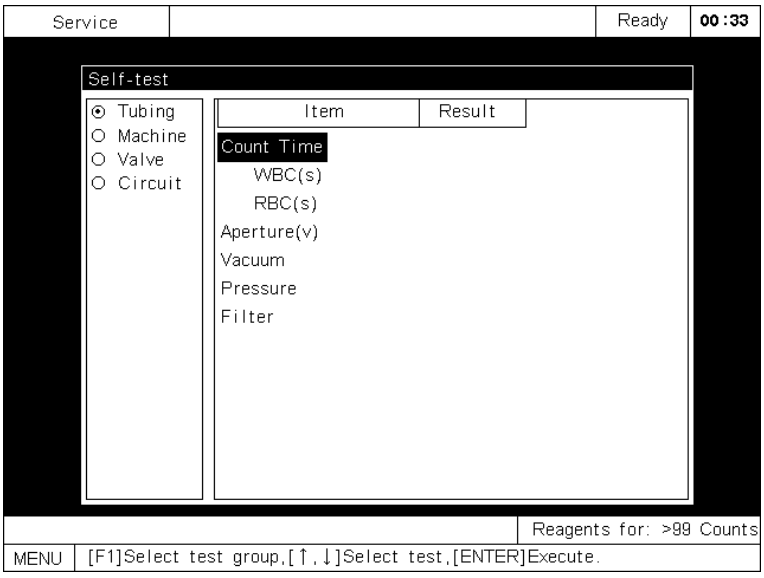


Figure 8-20 Self-test screen

The available self-test items are divided into four groups, the ***Tubing***, ***Machine***, ***Valve*** and

Circuit, as shown on the left of the screen. You can switch between the groups by pressing [F1] and once a group is selected, the test items, including their test results (if available), belonging to that group will be displayed on the right of the screen. You may press [PRINT] to print out the displayed results. Follow the instructions given below to conduct every test and if you want to acquire help information, press [HELP].

8.3.1 **Testing Tubing**

At the self-test screen, press [F1] to select the ***Tubing*** group, as Figure 8-20 shows. The following test items will be displayed on the right of the screen:

1. Count Time WBC（S）

It measures the duration of a WBC count, namely how many seconds it takes for the aspirated fluid flows from the first sensor to the second.

2. Count Time RBC（S）

It measures the duration of a RBC count, namely how many seconds it takes for the aspirated fluid flows from the first sensor to the second.

3. Aperture(v)

It measures the voltage (v) over the aperture.

4. Vacuum

It checks whether the vacuum system functions normally.

5. Pressure

It checks whether the system flushes the aperture at a normal pressure.

6. Filter

It checks whether the filter functions normally.

8.3.2 **Testing Motors and Recorder/Printer**

At the ***Self-test*** screen, press [F1] to select the ***Machine*** group, as Figure 8-21 shows. The following test items will be displayed on the right of the screen. Press [↑] or [↓] to select the desired item and press [ENTER] to conduct the test.

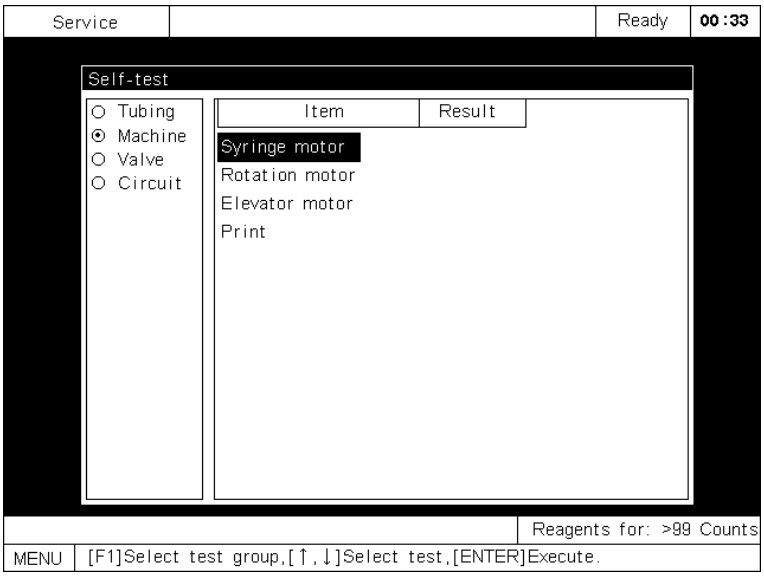


Figure 8-21 Testing mechanic parts

1. Syringe motor

The syringe motor controls the aspiration volume. This test checks whether the motor functions normally.

2. Rotation motor

The rotation motor rotates the sample probe inside the analyzer. This test checks whether the motor functions normally.

3. Elevator motor

The elevator motor controls elevation of the sample probe. This test checks whether the motor functions normally.

4. Print

This test checks whether the recorder or printer functions normally. If normal, when you can press [ENTER], the recorder or printer will print out Printer(recorder) test; if abnormal, the screen will display the corresponding error message and you can see **Chapter 9 Troubleshooting** for solutions.

8.3.3 **Testing Valves**

Malfunctioning valves will lead to malfunctions of the tubing. Therefore, testing the valves is a major way to remove fluidics errors.

At the ***Self-test*** screen, press [F1] to select the ***Valve*** group, as Figure 8-22 shows. The following test items will be displayed on the right of the screen. Press the appropriate arrow keys ([↑][↓][←][→])to select the valve you want to check and press [ENTER] to test it. If the valve goes through the Off-On-Off sequence without making abnormal sound, it passes the

test. Otherwise, something may be wrong with the valve.

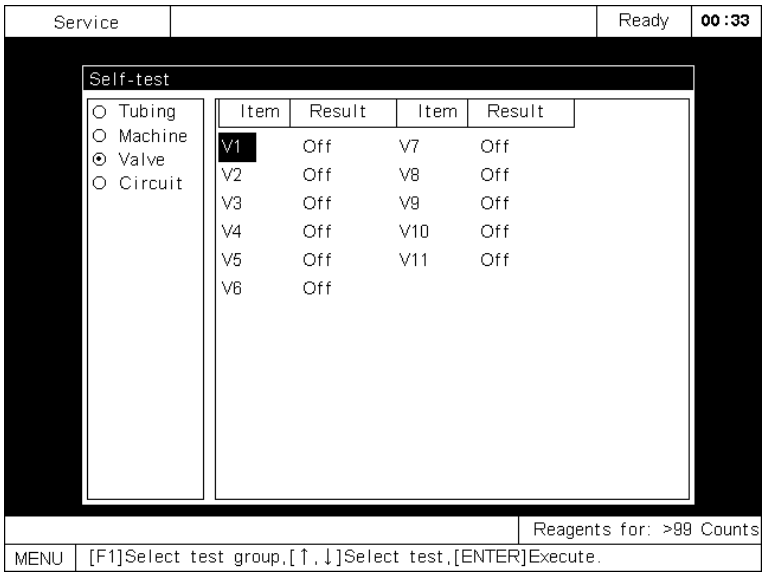


Figure 8-22Testing valves

8.3.4 **Testing Circuits**

At the ***Self-test*** screen, press [F1] to select the ***Circuit*** group, as Figure 8-23 shows. You can test the **A/D interrupt** at this screen by pressing [ENTER] to see whether the WBC, RBC and PLT signals can be properly converted into digital signals.

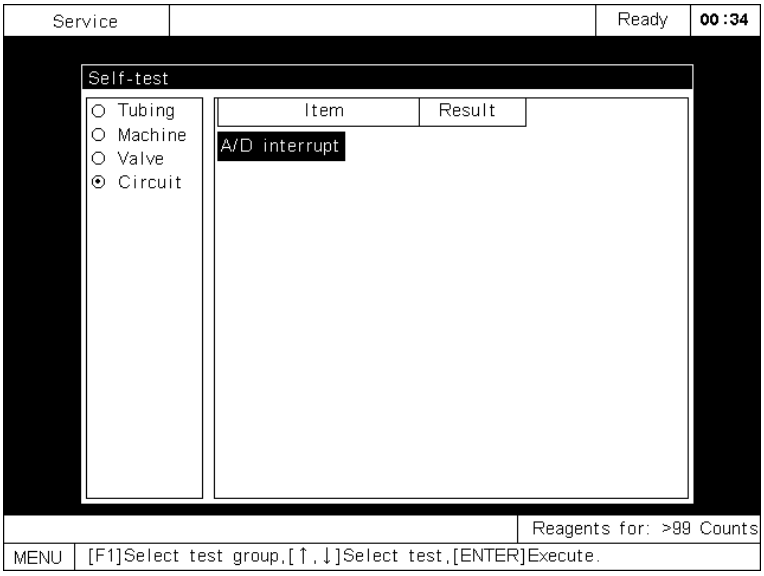


Figure 8-23 Testing A/D converter

8.5 **Log**

The log records all the major events taking place during the running of this analyzer. It helps the service engineers diagnose system errors.

Press [MENU] to enter the system menu and press the appropriate arrow keys ([↑][↓][←][→]) to move the cursor to ***Service→Log***, as Figure 8-24 shows.

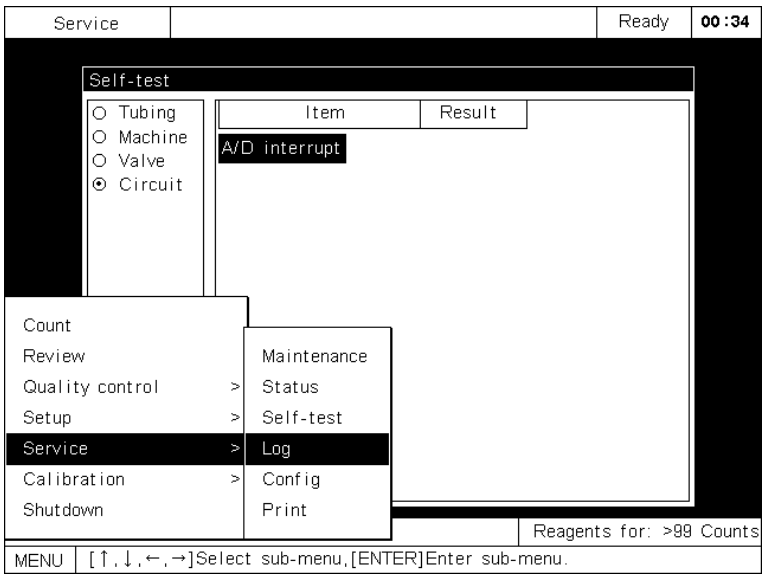


Figure 8-24 Entering log

Press [ENTER] to enter the ***Log*** screen, as Figure 8-25 shows.

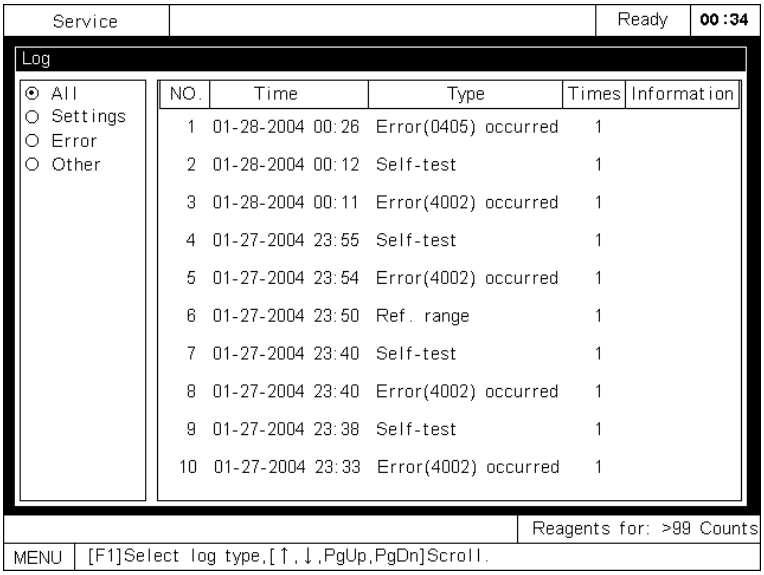


Figure 8-25 Log screen

The recorded events are divided into four groups, ***All, Para set***, ***Error*** and ***Other*** (including setting discriminators, system self-test and updating system software), which are all listed on

the left of the screen. All the recorded are listed on the right of the screen by default. You can press [F1] to select the interested group and the right of the screen will display the events of the selected group only. Every screen displays 10 events. You can press [↑] or [↓] to check the events one by one or press [PgUp] or [PgDn] to check the events on the previous or next screen. If you want to print out the displayed events, press [PRINT]. If you want to acquire help information, press [HELP].

For every recorded event, the ***NO.*** column displays the sequences of the recorded events; the ***Time*** column displays the time when this event occurred; the ***Type*** column displays the event type (the error events are also marked the corresponding error codes that are explained in Chapter 10.1); the ***Times*** column displays how many times (1～255) this event occurred and if it occurred more than 255 times, the excessive events will be recorded from 1 to another log file; the ***Information*** column displays extra information regarding the event.

This analyzer can save maximum 100 log files and once the maximum number has been reached, the newest log will automatically cover the oldest one.

8.6 System Configuration

To view the system configuration, press [MENU] to enter the system menu, and then press the appropriate arrow keys to move the cursor to ***Service→Config***.

Press [ENTER] to enter the Config screen, as Figure 8-26 shows, where you can only view the system configuration without changing it.

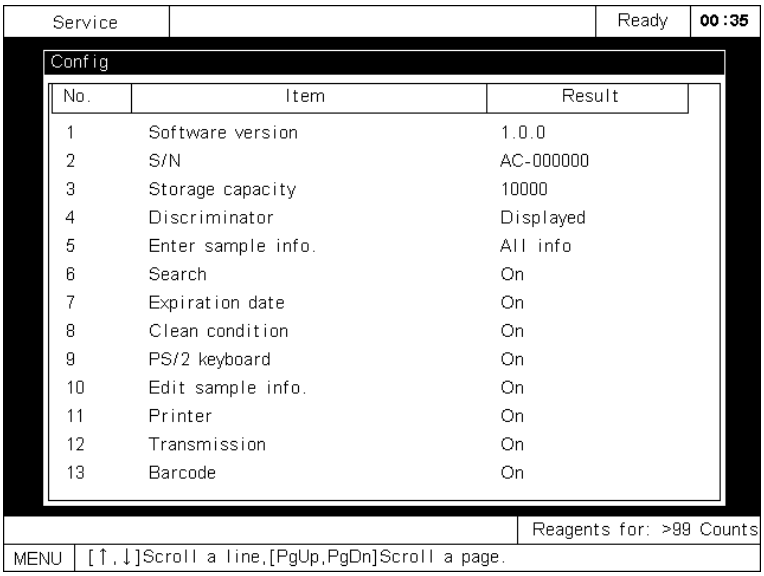


Figure 8-26 Configuration

Every screen displays 13 items and you can press [↑] or [↓] to select the item you want to see, or press[PgUp] or [PgDn] to go to the previous or next screen. If you want to print out the configuration, press [PRINT]. If you want to acquire help, press [HELP].

8.7 **Printing Management**

Press the [MENU] to enter the system menu and press the appropriate arrow keys ([↑][↓][←][→])to move the cursor to ***Service→Print***, as Figure 8-27 shows.

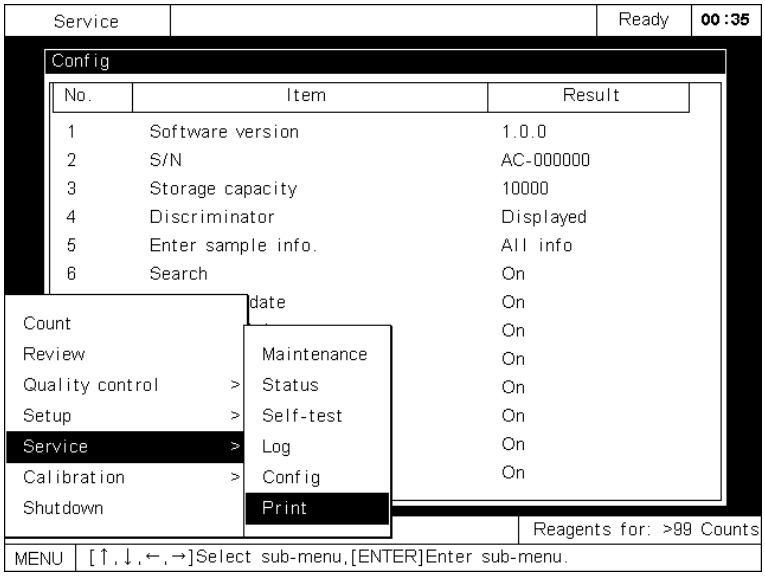


Figure 8-27 Entering print screen

Press [ENTER] to enter the ***Print*** screen, as Figure 8-28 shows. The printing tasks are queued in this screen, where you can view the all tasks and delete those waiting to be processed. Once something goes wrong with the printing device, the task being processed will be deleted and the queued tasks will keep waiting. Once the system finds the error has been removed, it will resume printing and process the tasks from the first one. Note that you cannot change the sequence of the queued tasks.

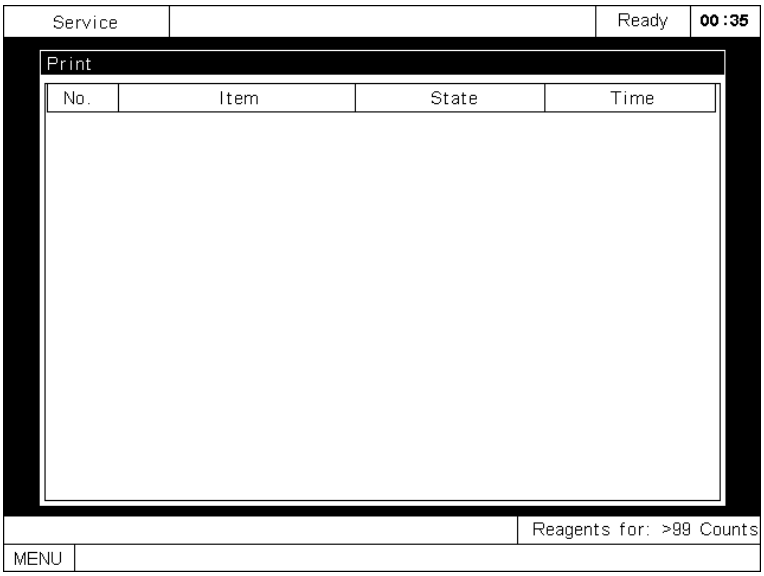


Figure 8-28 Print screen

You can perform the following operations at the ***Print*** screen:

- Press [↑] or [↓] to select the desired task.
- Press [DEL] to delete the selected task.
- Press [HELP] to display the help information.
- Press [MENU] to return to the system menu.

8.8 Adjusting Sample Probe and Probe Wipe Block

The relative position between the sample probe and probe wipe block has influence on the analysis results. In the accessory box, there is a sample probe localizer, as Figure 8-30 shows. You need to use the localizer to adjust the position of the sample probe if you have replaced wipe block, or observed motor error, or wrong analysis result. Also, as required by regular maintenance, you should use the localizer to adjust the position of the sample probe monthly.

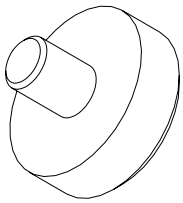


Figure 8-29 Probe localizer

8.8.1 Adjusting Sample Probe Position

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Warning

The probe is sharp and may contain biohazard materials, including controls and calibrators. Avoid any unnecessary contact with the probe and probe area.

Follow the steps given below to adjust the sample probe position:

1. Refer to **Chapter 8.1.8** and follow the steps 1 and 2 to remove the right plate of this analyzer.

2. Access the ***Setup→Password*** screen and enter the administrator password to obtain the administrator authority (see **Chapter 7.1.1**). Access the ***Service→Self-test*** screen.

3. Press [F1] to select the ***Machine*** group and press [↑] or [↓] to move the cursor to Elevator motor, as Figure 8-30 shows.

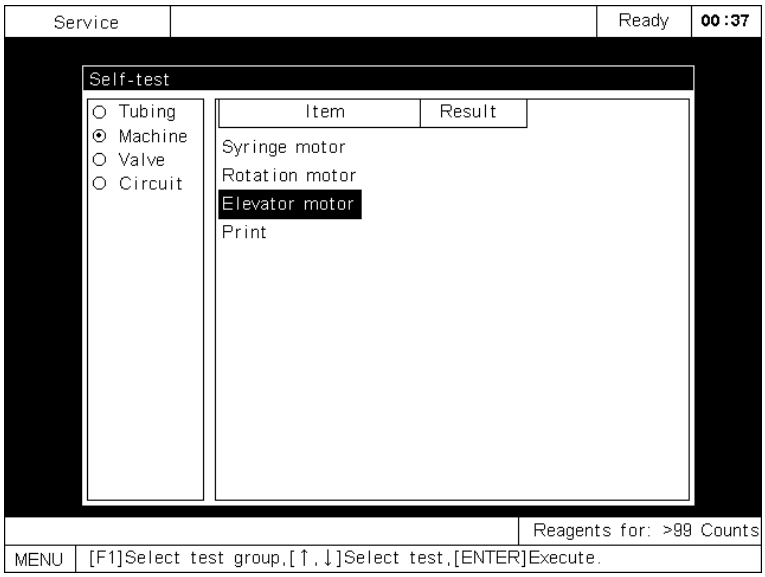


Figure 8-30Testing elevator motor

4. Press [ENTER] and an elevator motor screen will pop up, as Figure 8-31 shows.

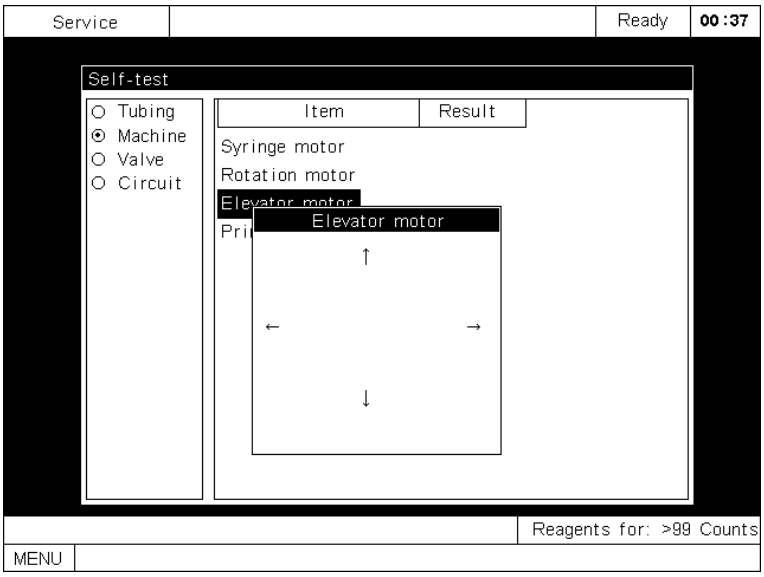


Figure 8-31 Elevator motor screen

5. Press [↑] to move the sample probe upward and press [→] to move the probe to above the bath, as Figure 8-32 shows.

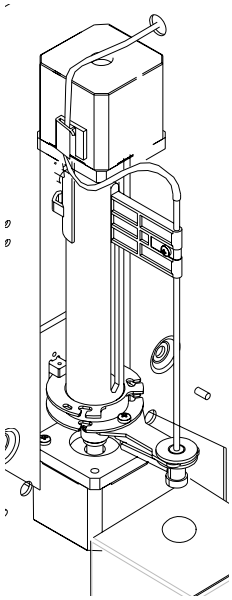


Figure 8-32 Sample probe above the bath

6. Loose the retaining screw by a screwdriver, as Figure 8-33 shows.

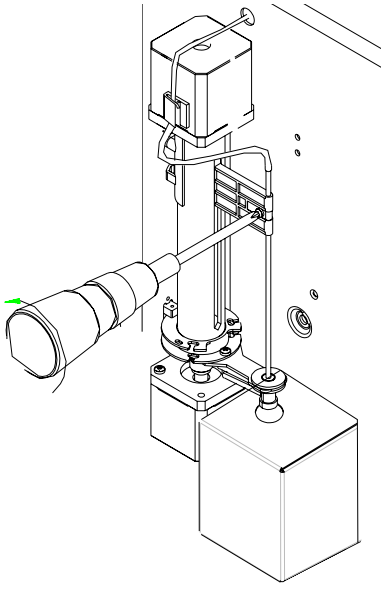


Figure 8-33 Removing screws

7. Remove the probe from the wipe block and insert the localizer into the wipe block from the bottom, as Figure 8-34 shows.

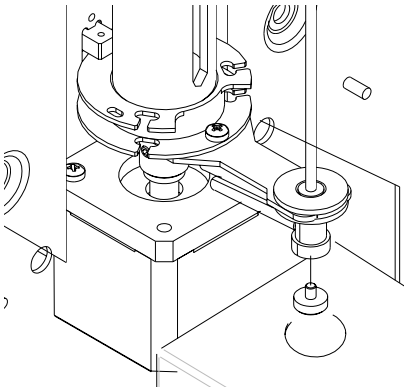


Figure 8-34 Using localizer

8. Insert the probe into the wipe block until it reaches the localizer, as Figure 8-35 shows.

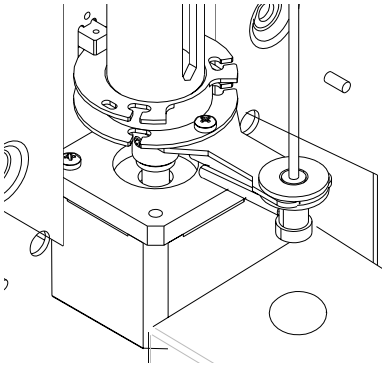


Figure 8-35 Inserting sample probe into wipe block

9. Retighten the screw to fix the probe and remove the localizer to wrap up the adjustment.

8.8.2 Replacing Probe Wipe Block

Biohazard

Wear standard laboratory attire, glove and follow safe laboratory procedures when handling any material in the laboratory.

Warning

The probe is sharp and may contain biohazard materials, including controls and calibrators. Avoid any unnecessary contact with the probe and probe area.

Follow he steps given below to replace the probe wipe block：

1. Refer to **Chapter 8.7.1** and do the steps 1~6.

2. Pull the loosen sample probe upward to remove the wipe block and disconnect the tubes from the wipe block (pay attention to the correspondence between the tubes and the connectors), as Figure 8-36 shows.

3. Refer to **Chapter 8.7.1** and do the steps 7~9 of fix the sample probe.

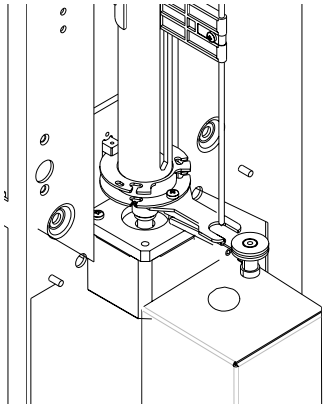


Figure 8-36 Installing wipe block

Chapter 9 **Troubleshooting**

The chapter deals with the codes, possible causes and solutions of the errors. If the error remains after you have tried the recommended method, call Mindray Customer Service Department or the distributor. This chapter consists of two parts, the first part dealing with the errors and assigned error codes and the second possible causes and recommended solutions.

9.1 Error Codes

The errors recorded in the log are presented in the error codes. See Table 9-1 for the correspondence between the errors and error codes.

Table 9-1 Errors and codes

Code	Error	Code	Error	Code	Error
0401	Envir. Temp. Abnormal	0402	Background abnormal	0403	HGB error
0404	HGB adjust	0405	WBC clog	0406	WBC bubbles
0407	RBC clog	0408	RBC bubbles		
0801	Communication error	0802	Scanner error	0803	Scanner communication error
1001	Printer out of paper	1002	Printer connection error	1003	Recorder communication error
1004	Recorder out of paper	1005	Recorder too hot	1006	Press bar up
2001	Lyse out	2002	Diluent expired	2003	Rinse expired
2004	Lyse expired	2005	Filer error	2006	Real-time clock error
4002	Syringe motor error	4003	Rotation motor error	4004	Elevator motor error
4005	A/Derror	4008	Vacuum error	4009	Press error
400B	Diluent out	400C	Rinse out	400D	Waste full
8001	File error	8002	Dynamic memory error		

9.2 Solutions

This chapter presents measures to be taken when the errors occur.

9.2.1 A/D Error

Something is wrong with the A/D converter on the CPU board.

Solution：
Access ***Service*** → ***Self-test*** → ***Circuit***. Test the A/D interrupt as instructed by **Chapter 8.4.4**. The error will be cleared if the test result is normal. Otherwise, call Mindray Customer Service Department or the distributor.

9.2.2 Dynamic Memory Error

Something is wrong with the system memory.

Turn off the analyzer and call Mindray Customer Service Department or the distributor.

9.2.3 HGB Error

HGB gain is not correct and HGB blank voltage is within 0V～3.2V or 4.9V～5V.

Solution：
Access ***Setup*** → ***Password*** to gain the administrator authority as instructed by **Chapter 7.1.1.** Access ***Setup*** → ***Settings*** → ***Gain*** to adjust the HGB blank voltage to 3.4～4.8V (4.5V recommended) as instructed by **Chapter 7.2.4.3**. If the error still remains, turn off this analyzer and call Mindray Customer Service Department or the distributor.

9.2.4 HGB Adjustment

HGB gain is not correct and HGB blank voltage is within 3.2 --- 3.4V or 4.8 --- 4.9V.

Solution：
Access Setup → Password to gain the administrator authority as instructed by Chapter 7.1.1. Access Setup → Settings → Gain to adjust the HGB blank voltage to 3.4～4.8V (4.5V recommended) as instructed by **Chapter 7.2.4.3.** If the error still remains, turn off this analyzer and call Mindray Customer Service Department or the distributor.

9.2.5 RBC Clog

This error message occurs when the actual RBC count time is greater than the preset RBC count time by 2 seconds.

Possible causes：clogged aperture; inappropriate RBC count time settings or solenoid valve error.

Solution：

1. Access ***Service*** → ***Maintenance*** and do the **Zap aperture** and **Flush aperture** procedures as instructed by **Chapters 8.2.4 and 8.2.5.**

2. After unclogging, access ***Setup*** → ***Settings*** → ***Count*** to note down the preset RBC count time. Access ***Service*** → ***Self-test*** →***Tubing*** and test the actual RBC count time as instructed by **Chapter 8.4.1**.

If the tested time differs from the preset time by less than 2 seconds, it means the unclogging is successful and you can return to the Count screen to continue the analysis. Other wise, Access ***Service*** → ***Maintenance*** to soak the bath and tubing with probe cleanser as instruction by **Chapter 8.2.6.**

When the soaking is done, access ***Setup*** → ***Settings*** → ***Count*** to note down the preset RBC count time. Access ***Service*** → ***Self-test*** → ***Tubing*** and test the actual RBC count time as instructed by **Chapter 8.4.1**. If the tested time differs from the preset time by less than 2 seconds, it means the unclogging is successful and you can return to the Count screen to continue the analysis. If the difference is still greater than 2 seconds and stabilized around a certain value, access ***Setup*** → ***Settings*** → ***Count*** to change the RBC count time accordingly. After the adjustment, test the actual count time again and make sure the difference is within 2 seconds.

3. If the error still remains, call Mindray Customer Service Department or the distributor.

9.2.6 RBC Bubbles

This error message occurs when the actual RBC count time is less than the preset RBC count time by 2 seconds.

Possible causes：

1. Insufficient diluent or rinse.
2. Loose tubing connection；
3. Inappropriate RBC count time setting.

Solution：

1. Check if the diluent or rinse is sufficient. If not, change a new container of diluent of rinse as instructed by **Chapter 2.3.**

2. Check the tubing connections. If necessary, reconnect the tubing as instructed by **Chapter**

2.3.

3. If the error still remains, Access ***Setup*** → ***Password*** to gain the administrator authority as instructed by **Chapter 7.1.1** and then access ***Setup*** → ***Settings*** → ***Count*** and adjust the RBC count time as instructed by **Chapter 7.2.5.2.**

4. If the error still remains, turn off this analyzer and call Mindray Customer Service Department or the distributor.

9.2.7 **WBC Clog**

This error message occurs when the actual WBC count time is greater than the preset WBC count time by 2 seconds.

Possible causes：clogged aperture; inappropriate WBC count time settings or solenoid valve error.

Solution：

1. Access ***Service*** → ***Maintenance*** and do the Zap aperture and Flush aperture procedures as instructed by Chapters 8.2.4 and 8.2.5.

2. After unclogging, access ***Setup*** → ***Settings*** → ***Count*** to note down the preset WBC count time. Access ***Service*** → ***Self-test*** → ***Tubing*** and test the actual WBC count time as instructed by Chapter 8.4.1.

If the tested time differs from the preset time by less than 2 seconds, it means the unclogging is successful and you can return to the Count screen to continue the analysis. Otherwise, Access ***Service*** → ***Maintenance*** to soak the bath and tubing with probe cleanser as instruction by Chapter 8.2.6.

When the soaking is done, access ***Setup*** → ***Settings*** → ***Coun***t to note down the preset WBC count time. Access ***Service*** → ***Self-test*** → ***Tubing*** and test the actual WBC count time as instructed by **Chapter 8.4.1**. If the tested time differs from the preset time by less than 2 seconds, it means the unclogging is successful and you can return to the Count screen to continue the analysis. If the difference is still greater than 2 seconds and stabilized around a certain value, access ***Setup*** → ***Settings*** → ***Count*** to change the WBC count time accordingly. After the adjustment, test the actual count time again and make sure the difference is within 2 seconds.

3. If the error still remains, call Mindray Customer Service Department or the distributor.

9.2.8 **WBC Bubbles**

This error message occurs when the actual WBC count time is less than the preset WBC count time by 2 seconds.

Possible causes：

1. Insufficient diluent or rinse.
2. Loose tubing connection；
3. Inappropriate WBC count time setting.

Solution：

1. Check if the diluent or rinse is sufficient. If not, change a new container of diluent of rinse as instructed by **Chapter 2.3.**
2. Check the tubing connections. If necessary, reconnect the tubing as instruction by **Chapter 2.3.**
3. If the error still remains, access ***Setup → Password*** to gain the administrator authority as instructed by **Chapter 7.1.1** and then access ***Setup → Settings → Count*** and adjust the WBC count time as instructed by **Chapter 7.2.5.2**.
4. If the error still remains, turn off this analyzer and call Mindray Customer Service Department or the distributor.

9.2.9 Background Abnormal

At least one parameter failed the background check.

Solution：

At the Count screen, press [F3] to do the startup procedure. If the error still remains, access ***Service → Maintenance*** and do the Probe cleanser cleaning procedure as instructed. When the cleaning is done, return to the Count screen and check the background again to seen whether the error is cleared. If not, call Mindray Customer Service Department or the distributor.

9.2.10 **Rinse Expired**

Possible causes： rinse has expired or its expiration date is not correctly set.

Solution：

Check the rinse. If it is expired, change a new container of rinse as instructed by **Chapter 2.3**; if not, access ***Setup → Settings → Reagents*** and adjust the expiration date as instructed by **Chapter 7.2.1.3.**

9.2.11 Printer Out of Paper

Possible cause：The printing paper ran out or is not correctly installed.

Check the whether the printer is out of paper. If so, load paper to the printer; otherwise, re-install the existing paper.

9.2.12 Printer Connection Error

Check whether the printer is well connected to the analyzer.

9.2.13 Waste full

The waste container is full.

Empty the container as instructed by **Chapter 2.3**, or change a new container to receive the waste and re-set the waste container volume as instructed by **Chapter 7.2.1.2**.

9.2.14 Filter error

Something is wrong with the filter of the vacuum chamber.

Solution：
Access ***Service*** → ***Self-test*** → ***Tubing*** and test the filter as instructed by **Chapter 8.4**. The error is cleared if the result is normal. If not, call Mindray Customer Service Department or the distributor.

9.2.15 Environmental Temperature Abnormal

Possible causes：abnormal environmental temperature or malfunctioning temperature sensor.

Solution：
Access ***Service*** → ***Status*** and check the environmental temperature. If the temperature exceeds the specified range by 15℃-35℃, you need to adjust the work environment of this analyzer so that the analyzer works in the requested environment. If the temperature is within the requested range and the error remains, call Mindray Customer Service Department or the distributor.

9.2.16 Recorder Out of Paper

Possible causes：recording paper has run out or is not correctly installed.

Solution：
Check whether the recording paper has run out. If so, load new paper; if not, re-install the existing paper as instructed by **Chapter 2.3.3**. If the error still remains, call Mindray Customer Service Department or the distributor.

9.2.17 **Recorder Communication Error**

Call Mindray Customer Service Department or the distributor.

9.2.18 Recorder Too Hot

Possible causes：the recording head overheats.

Stop using the recorder. If the error repeats, call Mindray Customer Service Department or the distributor.

9.2.19 **Press Bar Up**

The press bar of the recorder is up.

Push it back as instructed by **Chapter2.3.3** If the error still remains, call Mindray Customer Service Department or the distributor.

9.2.20 **Rotation Motor Error**

Something is wrong with the motor that rotates the sample probe.

Access ***Service →Self-test → Machine*** and test the motor as instructed by **Chapter 8.4.2**. The error will be cleared if the result is normal. Otherwise, call Mindray Customer Service Department or the distributor.

9.2.21 **Lyse Expired**

The lyse has expired.

Check whether the lyse has expired. If so, change a new container of lyse as instructed by **Chapter 2.3;** if not, access ***Setup → Settings → Reagents*** and adjust the expiration date as instructed by **Chapter 7.2.1.3.**

9.2.22 Elevator Motor Error

Something is wrong with the motor that controls elevation of the sample probe.

Access ***Service → Self-test → Machine*** and test the motor as instructed by **Chapter 8.4.2**. The error will be cleared if the result is normal. Otherwise, call Mindray Customer Service Department or the distributor.

9.2.23 Real-Time Clock Error

Something is wrong with the clock.

Access ***Setup → Settings → Date & Time*** and set the time and date as instructed by **Chapter 7.2.3** and restart the analyzer to enable the new settings. If the error still remains, call Mindray Customer Service Department or the distributor.

9.2.24 Scanner Error

Too long or invalid bar code.

Check and make sure the bar code is correct. If the error still remains, call Mindray Customer Service Department or the distributor.

9.2.25 Scanner Communication Error

Something is wrong with the communication between the scanner and the analyzer.

Check the connection between the two devices.

9.2.26 Communication Error

The received communication settings are different with the BC-2800.

Access ***Setup → Settings → Print & comm.*** and change the communication settings accordingly as instructed by **Chapter 7.2.2.2.**

9.2.27 File Error

Something is wrong with file saving.

Turn off the analyzer and call Mindray Customer Service Department or the distributor.

9.2.28 Rinse Out

Possible causes：insufficient rinse or wrong rinse volume setting.

Solution：
Check if there is sufficient rinse left. If so, access ***Setup → Settings → Reagents*** and adjust the remaining rinse volume as instructed by **Chapter 7.2.1.1**; if not, change a new container of rinse as instructed by **Chapter 2.3**.

9.2.29 Lyse Out

Possible causes：insufficient lyse or wrong lyse volume setting.

Solution：
Check if there is sufficient lyse left. If so, access ***Setup → Settings → Reagents*** and adjust the remaining lyse volume as instructed by **Chapter 7.2.1.1**; if not, change a new container of lyse as instructed by **Chapter 2.3.**

9.2.30 Diluent Out

Possible causes：insufficient diluent or wrong diluent volume setting.

Solution：
Check if there is sufficient diluent left. If so, access ***Setup → Settings → Reagents*** and adjust the remaining diluent volume as instructed by **Chapter 7.2.1.1**; if not, change a new container of diluent as instructed by **Chapter 2.3.**

9.2.31 Diluent Expired

The diluent has expired.

Check whether the diluent has expired. If so, change a new container of diluent as instructed by **Chapter 2.3**; if not, access ***Setup → Settings → Reagents*** and adjust the expiration date as instructed by **Chapter 7.2.1.3.**

9.2.32 Pressure Error

The vacuum chamber does not reach the expected pressure within the given time.

Solution：

Access ***Service*** → ***Self-test*** → ***Tubing*** and test the pressure as instructed by **Chapter 8.4.1**. The error will be cleared if the result is normal; otherwise, call Mindray Customer Service Department or the distributor.

9.2.33 Vacuum Error

The system does not reach the expected vacuum within the given time.

Solution：

Access ***Service*** → ***Self-test*** → ***Tubing*** and test the vacuum as instructed by **Chapter 8.4.1**. The error will be cleared if the result is normal; otherwise, call Mindray Customer Service Department or the distributor.

9.2.34 Syringe Motor Error

Something is wrong with the motor controls the syringe that aspirates/dispenses samples and reagents.

Solution：

Access ***Service*** → ***Self-test*** → ***Machine*** and test the motor as instructed by **Chapter 8.4.2**. The error will be cleared if the result is normal; otherwise, call Mindray Customer Service Department or the distributor.

Appendix A Communication

（BC-2800 Communication Protocol）

The BC-2800 can transmit the sample data and QC data to an external computer through its RS-232C serial port. The transmission can be conducted either automatically or through the command of the operator after the completion of the sample analysis. This section gives detailed discussion about the setup of transmission parameter, RS-232C Serial Port and the Data Transmission Format, therefore, providing detailed information for the software engineers to program. Besides, the user can conveniently perform transmission.

A.1 Connection

The BC-2800 can be connected with an external computer through a DB9 connector. The pins of the DB9 connector are shown in Figure A-1.

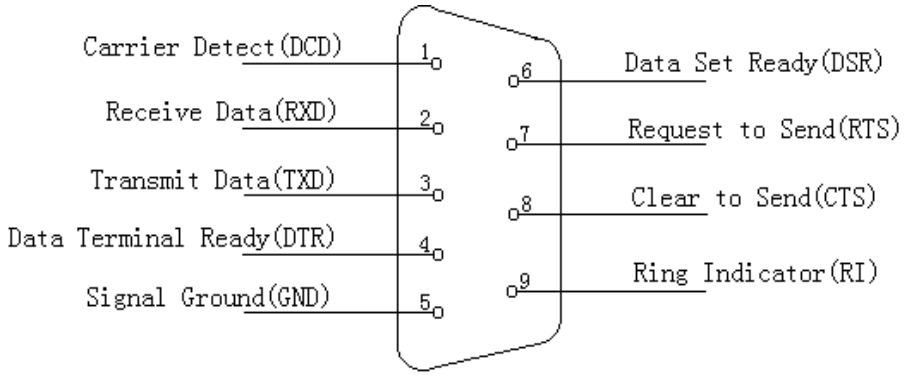


Figure A-1 DB9 connector

BC-2800 can communicate with an external computer through its serial port 2, using the Pin 2, Pin 3 and Pin 5 of the DB9 connector.

A.2 Setting Transmission Parameters

The data format is fixed for the transmission so that every byte to be transmitted has 7 data bits and 1 stop bit. Enter ***Setup*** → ***Settings*** and press [F1] to select the ***Print&comm***. group and edit the communication settings as instructed by **Chapter 7.2..2.2.**

A.3 Transmission

A.3.1 Transmission at Count Screen

If the auto transmission function is on, once the analysis is done, the BC-2800 will automatically transmit the results to the external computer. If the auto transmission function is off, you can only transmit the results manually at the ***Review*** screen.

A.3.2 Transmission at Review Screen

Select the results you want to transmit and transmit them to the external computer as instructed by Chapter 6.2.4.

A.3.3 Transmission at QC Table Screen

Transmit the results as instructed by Chapter 4.1.5.

A.4 Transmission Date Format

A.4.1 Description

A.4.1.1 Symbols

Table A-1 Symbols

[ENQ]	0x05
[STX]	0x02
[EOT]	0x04
[EOF]	0x1A
[ETX]	0x03
[ACK]	0x06
[NACK]	0x15
"A"	0x41
"B"	0x42
"C"	0x43
"#"	0x30-0x39
"*"	0x2A

A.4.1.2 Programming

If the Handshake is off, BC-2800 will transmit the body of the text without acknowledging the presence of an external computer.

If the Handshake is on, BC-2800 will communicate with the external computer in following

procedures:

1. BC-2800 sends an ENQ (05 Hex), then waits up to 4 seconds for the external computer to respond. If the external computer does not respond, then one more ENQ (05 Hex) is tried before giving up.
2. The external computer must respond by sending an ACK (06 Hex). If any other response is received, another ENQ (05 Hex) will be sent by the analyzer (a maximum of only two ENQ [05 Hex] will be sent).
3. The analyzer then sends：
   Body of text
   EOT (04 Hex)
   ETX (03 Hex)
4. Disconnection
   A. BC-2800 sends an ETX 03 Hex), then waits 4 seconds for the external computer to respond. If no response is received, one more ETX (03 Hex) is sent, BC-2800 waits 4 seconds before giving up and gives alarm of communication error.
   B. The external computer must respond by sending an ACK (06 Hex). If the external computer responds by sending a NACK (15 Hex), then BC-2800 will execute Step 3 once again. If anything else is received, BC-2800 will send ETX (03 Hex) once more.

A.4.2 Sample Date Format

Sample Data Format as shown in Table A-2：

Table A-2 Sample Data Format

If handshake is selected	[ENQ]
If handshake is not selected	[STX]
Body of the text start	
Text Distinction Code	“A”
ID	########
Sample Mode	#
Month	##
Day	##
Year	####
Hour	##
Minutes	##
Seconds	##
WBC[10^9/L]	###.#
Lymph#[10^9/L]	###.#

Mid#[10^9/L]	###.#
Gran#[10^9/L]	###.#
Lymph%[%]	##.#
Mid%[%]	##.#
Gran%[%]	##.#
RBC[10^{12}/L]	##.#
HGB[g/L]	###
MCHC[g/L]	####
MCV[fL]	###.#
MCH [pg]	###.#
RDW-CV[%]	##.#
HCT[%]	##.#
PLT[10^9/L]	####
MPV[fL]	##.#
PDW	##.#
PCT[%]	.###
RDW-SD[fL]	###.#
Reserved	############
Rm	#
R1	#
R2	#
R3	#
R4	#
Pm	#
Ps	#
Pl	#
L1 Region	###
L2 Region	###
L3 Region	###
L4 Region	###
L5 Region	###
L6 Region	###
L7 Region	###
L8 Region	###
Reserved	################
WBC Histo (256 channels)	###
RBC Histo (256 channels)	###

PLT Histo (256 channels)	###
Body of the text end	
If handshake is selected	[EOT]
If handshake is not selected	[EOF]

For all the data formats, if the data are mark "*" in BC-2800, then "*" (2A Hex) will be transmitted to the external computer.
L1 Region - L8 Region are LI - L8 of eight histogram discriminators as shown in Figure A-2.

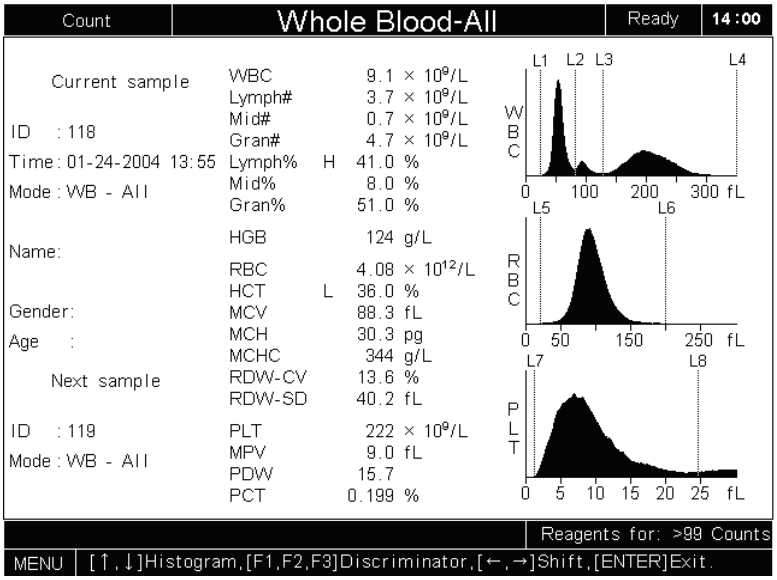


Figure A-2 L1- L8 demonstration

A.4.3 Standard QC Data Format

Standard QC Data Format as shown in Table A-3：

Table A-3 Standard QC Data Format

If handshake is selected	[ENQ]
If handshake is not selected	[STX]
Body of the text start	
Text Distinction Code	"B"
File No.	#
Lot No.	######
Month	##
Day	##
Year	####
WBC[10^9/L]	###.#
RBC[10^{12}/L]	#.##
HGB[g/L]	###

PLT[10^9 /L]	####
Lymph#[10^9/L]	###.#
Lymph%[%]	##.#
Gran#[10^9/L]	###.#
Gran%[%]	##.#
HCT[%]	##.#
MCV[fL]	###.#
MCH[pg]	###.#
MCHC[g/L]	####
WBC Limit[10^9/L]	###.#
RBC Limit[10^{12}/L]	#.##
HGB Limit[g/L]	###
PLT Limit[10^9/L]	####
Lymph# Limit[10^9/L]	###.#
Lymph% Limit[%]	##.#
Gran# Limit[10^9/L]	###.#
Gran% Limit[%]	##.#
HCT Limit[%]	##.#
MCV Limit[fL]	###.#
MCH Limit[pg]	###.#
MCHC Limit[g/L]	####
Body of the text end	
If handshake is selected	[EOT]
If handshake is not selected	[EOF]
If handshake is selected	[ETX]

If the Lot No., Month, Day, Year are empty in QC Edit menu, the “*” (2A Hex) will be transmitted to the external computer.

A.4.4 Run QC Data Format

Standard QC Data Format as shown in Table A-4：

Table A-4 Run QC Data Format

If handshake is selected	[ENQ]
If handshake is not selected	[STX]
Body of the text start	
Text Distinction Code	‘C’
Month	##
Day	##

Year	####
Hour	##
Minutes	##
WBC[10^9/L]	###.#
RBC[10^{12}/L]	#.##
HGB[g/L]	###
PLT[10^9/L]	####
Lymph#[10^9/L]	###.#
Lymph%[%]	##.#
Gran#[10^9/L]	###.#
Gran%[%]	##.#
HCT[%]	##.#
MCV[fL]	###.#
MCH[pg]	###.#
MCHC[g/L]	####
Body of the text end	
If handshake is selected	[EOT]
If handshake is not selected	[EOF]
If handshake is selected	[ETX]

P/N: 2800-20-28795